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Important Developments Due

In Placing of Large Orders by Foreign Buyers—Eastern Investors Buy Large Tonnage of Pig Iron—Heavy Demand for Machine Tools

Reports of tremendous orders and inquiries for rails, rolling stock and other railway supplies for Russia involve such great tonnages as to indicate gross exaggeration, but it is true that some very important foreign business is being considered by companies of high standing and it is probable that there will soon be important developments. Much of the foreign business is conducted with extreme secrecy and it will not be surprising if denials are followed by positive evidence of large bookings, as has been the case in regard to other reports. Positive evidence of the large volume of foreign business taken in the past few weeks is furnished by rush orders for structural steel, aggregating 10,000 tons during the past week, for the construction of new buildings by companies engaged in the manufacture of war materials. The export demand for machine tools continues fully as strong as at any time since war was declared, most of the buying being by Russia and England. An important order for equipment for turning out projectiles has been placed by the Tredegar Iron Works, Richmond, Va. The Crucible Steel Co. of America will erect three new buildings requiring 4,000 tons of structural steel at its plant at Harrison, N. J., for the production of machine forgings. It is reported that Russia is about to close 150,000 tons of barbed wire with the Steel Corporation.

On the whole, the steel business made satisfactory progress during April and bookings were of fair volume at most mills, being in most cases heavier than in March. Many companies are now in the best position they have occupied for many months and prices are showing increasing steadiness. Quotations on fabricated steel, which have been extremely low, are showing improvement and business booked by important companies during the past week averages a dollar higher in eastern territory. Tube business is still backward and some mills are badly in need of orders. Ocean freight rates continue to be a very important factor in foreign business, which would increase to much larger proportions if freight rates were not so high. The United States Steel Corporation operated last week at 72 per cent of ingot capacity and expects to do better this week.

Pig Iron

New York capitalists have shown their confidence that prices of pig iron will advance by buying from 75,000 to 100,000 tons of northern and southern foundry and steel-making grades for investment. Advances in prices have been made by Virginia and Alabama furnaces and the sentiment prevailing in the southern states is much more cheerful. Buying in Chicago last month aggregated a much larger tonnage than in the preceding month. There is a fair amount of buying in the central west at present and the melt is being well maintained.

Sheets and Plates

The sheet market continues to show much irregularity in prices and reports of less than 1.80c, Pittsburgh, for No. 28 black are heard. The Pennsylvania railroad has distributed from 20,000 to 25,000 tons of steel, largely plates, to be used in the building of 2,100 cars at its Altoona plant.

Pipe

Prices of iron and steel pipe and boiler tubes have been advanced $2 per ton and a new card has been issued for oil country goods, showing the new zone system to be followed in shipments.

Domestic Business Grows in April

With War Demand at High Tide Machinery Trade is Encouraged by Improvement in Business from Purely Domestic Sources

APRIL witnessed even greater activity in the machine tool market than preceding months. Not only did the so-called "war demand" reach new record proportions, but domestic demand practically all over the country showed much improvement and, better still, much promise of further improvement in the future. The demand for machine tools for turning out war supplies came both from domestic manufacturers and from abroad. The export demand was extremely large during the month; at the close it was heavier than anything of the kind previously experienced by the machinery trade. Russia was buying on a tremendous scale and England bought in nearly as large volume. Other countries, too, were liberal purchasers. The export demand involved chiefly lathes and screw machines, and knee-type milling machines, but there was a better call for other kinds of machine tools, such as planers, boring mills, radial drills, etc., which previously had not been specially called for.

The domestic demand also was for machines adaptable for making ammunition, and so heavy were the purchases that manufacturers of these tools in numerous cases have withdrawn from the market in order to have an opportunity to catch up with their orders. During one week in April, orders were placed which involved in the aggregate more than 1,000 lathes alone. Despite the enlarged facilities of the manufacturers, and the extra shifts with which they are working, it is almost impossible now to secure deliveries sooner than October on some sizes of automatics, September or October on turret lathes, August or September on lathes, August on high speed drills, small turret screw machines, and hydraulic projectile presses, July on sensitive drills, etc.

Labor Troubles Threaten

DESPITE the large amount of business on their books, however, machine tool manufacturers in certain leading centers are manifesting some anxiety over threatened labor troubles. Employes at several plants operating day and night because of the war demand have made certain representations to their employers and at other plants the men are displaying symptoms which are regarded with concern. From the manner in whch this development became apparent simultaneously in different parts of the country, it is considered possible the movement may be a general one. The discontent so far is most noticeable at several of the machine tool plants and at least at two such plants strikes are considered possible. Trouble also appears to be brewing at some of the plants manufacturing war supplies.

Probably the largest single buyer of machine tools in April was the American Locomotive Co., which booked a contract for about $70,000,000 worth of projectiles and which is figuring on another contract involving about $10,000,000. This company bought considerably in excess of $1,000,000 worth of machine tools. The New York Air Brake Co., which finally closed the contract on which it was figuring, released its orders for machine tools, deliveries of which are being rushed. The Westinghouse interests, which booked further contracts, placed some more large orders for machine tools. The Canadian Car & Foundry Co. during the month sublet to a large number of concerns the greater part of its Russian projectile contract; details of these sublettings were announced in last week's issue of *The Iron Trade Review*. Practically all these concerns were buyers of machine tools on a large scale. Among other large war buyers of machine tools in April were the Bethlehem Steel Co., the General Electric Co., the Bridgeport Projectile Co., Bridgeport, Conn.; the Baldwin Locomotive Works, the Pratt & Whitney Co., the Remington Arms-Union Metallic Cartridge Co., the E. W. Bliss Co. and others.

G. M. Haardt, of the Mors Automobile Co., Paris, was a big buyer for export. The Locomobile Co. of America, Bridgeport, which booked big contracts for motor trucks for the belligerents, bought heavily. The Tredegar Iron Works, Richmond, Va., bought a large amount of machinery for manufacturing projectiles for the United States government. The Crucible Steel Co. of America is greatly enlarging its capacity at Harrison, N. J., to make projectiles and gun forgings for the United States government. The Snead & Co. Iron Works, Jersey City, N. J., is holding up some large orders which it was about to place for making shrapnel.

Railroads Come into the Market

RAILROAD buying showed a decided improvement. The leading purchaser was the Missouri, Oklahoma & Gulf, which issued a list of 30 to 40 tools and other equipment and closed on practically all of it. The Seaboard Air Line, whose machine shops at Portsmouth, Va., burned, bought some $50,000 worth of tools to use temporarily; large requirements remain to be purchased. The Atlantic Coast Line, the New York Central and the Santa Fe each bought several tools; the latter is expected to close shortly on some 10 additional tools. The Chicago, Burlington is inquiring on a list of some 50 tools. The Chesapeake & Ohio and the Lehigh Valley have inquiries pending on a few tools. The Pennsylvania, Chicago & North-Western and the Illinois Central are expected to put out inquiries shortly. Several railroads have crane inquiries out.

Good domestic buyers during April were the Curtis Aeroplane Co., Hammondsport, N. Y.; Simmons Mfg. Co., Kenosha, Wis.; Charles L. Seabury & Co., Morris Heights, N. Y.; the Standard Oil Co., Bayway, N. J.; the Scoville Mfg. Co., Waterbury, Conn., and many others, too numerous to mention. The scattered character of the buying, however, indicated improved conditions in a good many industries.

Plants are Being Enlarged

A GREAT many concerns throughout the country who have not booked any war business are expanding their manufacturing capacity. The Carnegie Steel Co. asked for bids on a number of cranes for its Munhall, Homestead and Schoen Steel Wheel plants. The Bethlehem Steel Co. placed an order for a complete 18-inch structural mill with the Morgan Engineering Co., Alliance, O.

Saving Time and Money by Welding

Description of a Difficult Job on a Large Condenser Manifold—The Oxy-Acetylene Method Saved 13 Days

THE oxy-acetylene process was the means of saving 13 days' time and a large amount of money by effecting certain alterations to the large gray iron condenser manifold shown in the accompanying illustrations. This manifold is used to connect the exhaust outlet of a large steam turbine with the inlet to the condenser. Owing to the changes in the plant in which it was installed, it became necessary either to obtain an entirely new casting or shorten the original casting 18 inches. A new casting would have cost $300 and 25 days would have been consumed in its production.

Instead of assuming this large expense and delay, the casting was shipped to the plant of the Oxweld Acetylene Co., Chicago, where an 18-inch section was cut out and the flange welded back into place in 1½ days. To this time should be added about 10 days for transportation, making a total of about 12 days or less than half the time it would have taken to procure a new part. The casting weighed 7,600 pounds and was of a complicated shape. The problem presented to the welders was unusual and required expert workmanship and supervision.

Fig. 1 shows the casting in its original condition with the 18-inch section partially drilled out. All of this work was done with an electric hand drill, as it is impossible to cut cast iron with the oxy-acetylene flame.

Fig. 2 shows the casting with the section removed and the flange moved back into place before welding. The piece which was taken out is shown in Fig. 4. The white line in Fig. 2 shows the joint between the two parts and indicates the line of weld. This illustration also shows a portion of the temporary brick pre-heating furnace constructed around the casting.

Fig. 3 shows the method of welding. A charcoal fire was built in the pre-heating furnace and was kept burning during the entire welding operation. Four men worked on the job continuously for 36 hours to complete it. As indicated in Fig. 3, the top of the casting was covered with asbestos sheets to hold in the heat and only the portion being welded was exposed.

Fig. 4 shows the finished job and also gives an idea of the size and weight of the section which was removed. It is said that it is practically impossible, even on close examination, to locate the line of the weld. Particular care was necessary to prevent distortion of the casting during welding inasmuch as the finished surfaces of the various flanges had to be kept absolutely square.

FIG. 1—CASTING PARTIALLY DRILLED BEFORE SECTION WAS TAKEN OUT

FIG. 2—NEARLY READY TO WELD, SHOWING PARTIALLY CONSTRUCTED PREHEATING FURNACE

FIG. 3—WELDING FLANGE BACK ONTO THE BODY OF THE CASTING

FIG. 4—THE JOB COMPLETED—THE SECTION REMOVED IS SHOWN AT THE LEFT

Pig Iron Production Shows Big Gain

Output Increases 41 Per Cent Since December—More Stacks Active—April Production Largest in Year

THE rapid improvement in the blast furnace industry of the country is revealed with remarkable clarity by the figures, just compiled, showing the production of coke and anthracite pig iron in April. The output in April was 2,114,518 tons compared with 2,046,280 tons in March, a gain of 68,238 tons.

The extent of the recovery is shown when a comparison is drawn with

MONTHLY PRODUCTION.

	1915.	1914.	1913.
January	1,591,024	1,879,336	2,787,800
February ...	1,666,592	1,888,607	2,578,670
March	2,046,280	2,341,551	2,762,823
April	2,114,518	2,261,501	2,754,353
May	.....	2,097,019	2,816,825
June	.....	1,904,566	2,616,883
Total 1st half.	.....	12,372,580	16,317,354
July	.....	1,955,324	2,558,275
August	.....	1,996,483	2,537,018
September .	.....	1,882,718	2,494,098
October	.....	1,767,227	2,539,924
November ..	.....	1,501,269	2,229,960
December ..	.....	1,495,325	1,976,138
Total 2d half.	.....	10,598,346	14,335,413
Grand total.	7,418,414	22,970,926	30,652,767

December, 1914, the low point in last year's ebbing pig iron production. The gain in tonnage is 620,000 tons, or 41 per cent. Of this, the steel works furnaces gained 38 per cent, the merchant furnaces 3 per cent. The number of stacks active shows a similar gain when compared with November, 1914, at which time only 150 stacks were active. On April 30, 197 stacks were in blast, showing a gain in five months of 47 stacks, or 31 per cent.

The production last month was the largest of any month since April, 1914. The output during April was at the yearly rate of 25,725,000 tons, which compares with an actual production in 1914 of 23,000,000 tons.

The daily average production in April was 70,484 tons, against 66,009 tons in March, a gain of 4,475 tons. The steel works or non-merchant furnaces absorbed practically all of this increase. During April these furnaces maintained an average production of 53,048 tons against 49,457 tons in March, a gain of 3,591 tons. The merchant furnaces averaged 17,025 tons in April and 16,139 tons in March, a gain of 886 tons.

Total production of the steel works furnaces in April was 1,591,426 tons compared with 1,533,170 tons in March, a gain of 58,256 tons. The production of merchant iron in April was 510,755 tons against 500,325 tons in March, a gain of 10,430 tons.

There was a net gain of seven in active stacks comparing the last days of March and April. Three merchant furnaces were blown in and two put out, a net gain of one. Seven steel works furnaces were relighted and one blown out, a net gain of six.

The production of ferro in April was 6,036 tons against 6,626 tons in March, a loss of 590 tons. Spiegel production in April was 6,301 tons and in March 6,159 tons, a gain last month of 142 tons.

The merchant furnaces blown in were: Federal "A", Federal Furnace Co., April 30; River No. 1, Corrigan, McKinney & Co., April 1, and Perry, Perry Iron Co., April 1. Those blown out were: Belfont, Belfont Iron Works Co., April 6, and Blanche, Marting Iron & Steel Co., April 22.

The steel works' furnaces blown in were: Joliet No. 4, Illinois Steel Co., April 1; Lackawanna No. 6, April 4, and Lackawanna No. 7, April 14, Lackawanna Steel Co.; Tod, Brier Hill Steel Co., April 1; Mattie, Girard Iron Co., April 1; Lorain No. 4, National Tube Co., April 12, and one New Castle, Carnegie Steel Co., April 24. One Central, American Steel & Wire Co., was blown out.

Robesonia, of the Robesonia Iron Co., Ltd., Robesonia, Pa., was blown out May 1. The stack will be torn down and a new furnace erected.

AVERAGE DAILY PRODUCTION.

	1915.	1914.	1913.	1912.
Jan. ...	51,323	60,624	89,929	66,220
Feb. ...	59,521	67,450	92,095	72,372
Mar. ...	66,009	75,534	89,123	77,791
Apr. ...	70,484	75,383	91,812	79,254
May ...	.....	67,646	90,865	80,753
June ...	.....	63,486	87,229	81,125
July ...	.....	63,075	82,525	77,502
Aug. ...	.....	64,403	81,839	80,650
Sep. ...	.....	62,757	83,137	81,482
Oct. ...	.....	57,007	81,933	86,569
Nov. ...	.....	50,042	74,322	87,985
Dec. ...	.....	48,236	63,746	89,590
Average	61,820	62,934	83,980	80,124

APRIL PIG IRON

States.	No. of stacks.	No. in blast last day of month.		Total tonnage made.		Totals	
		April.	Mar.	Merchant.	Non-Merchant.	April.	Mar.
Pennsylvania	157	83	81	128,905	735,400	864,305	888,286
Ohio	73	44	43	103,779	444,974	548,753	508,943
Alabama	45	15	15	113,274	26,228	139,502	136,963
Virginia	22	4	4	14,770	.....	14,770	17,050
New York	26	16	14	73,884	82,930	156,814	135,996
New Jersey	6	1	1	6,592	.....	6,592	6,738
Illinois	26	11	9	9,940	140,386	150,326	129,925
Colorado	6	2	2				
Indiana	10	8	8				
Maryland	4	2	2				
Wisconsin	6	2	2	14,654	155,254	169,908	159,416
Kentucky	7	1	1				
West Virginia	4	1	1				
Tennessee	18	4	4				
Washington	1	0	0	21,452	6,254	27,706	25,900
Georgia	2	0	0				
Texas	3	0	0				
Minnesota	1	1	1				
Michigan	3	2	2				
Missouri	1	0	0	23,505	.....	23,505	24,278
Spiegel—All states...						6,301	6,159
Ferro—All states....						6,036	6,626
Totals	421	197	190	510,755	1,591,426	2,114,518	2,046,280

Dinner to Mr. Billings

Charles A. Billings has resigned as manager of the Brooklyn plant of the American Bridge Co., in order to devote his entire time to personal interests. A dinner was given for Mr. Billings on April 30 at the Hotel McAlpin, New York City, when the employes of the company presented him with a handsome loving cup. Mr. Billings has been connected with the structural steel business for the past 33 years, having served for many years as manager of Post & McCord, and later as vice treasurer and manager of the American Bridge Co. He is widely and favorably known in the trade.

Coke Contracts

Pittsburgh, May 5. (By wire.)—One of the more important sellers of foundry coke is closing numerous contracts for 12-month shipments after July 1 on the basis of $2.50, ovens, which figure represents the price quoted by most sellers. That figure, however, is being shaded 10 cents when attractive lots are involved and some contracts for fuel continue to be offered at $2.25, ovens.

Merriman

Nominated for President American Society for Testing Materials

Mansfield Merriman, consulting engineer, 1071 Madison avenue, New York, has been nominated to the office of president of the American Society for Testing Materials to succeed President A. W. Gibbs, chief mechanical engineer Pennsylvania railroad, Philadelphia. Other nominations follow: Vice president, W. H. Bixby, retired brigadier general U. S. A., Lanier place, Washington, D. C. Members of the executive committee: James H. Gibboney, chief chemist Norfolk & Western railroad, Roanoke, Va.; William K. Hatt, professor applied mechanics, Purdue university, Lafayette, Ind.; John A. Mathews, operating manager and general superintendent Halcomb Steel Co., Syracuse, N. Y., and Edward Orton Jr., dean College of Engineering, Ohio State university, Columbus, O.

The annual meeting of the American Society for Testing Materials will be held at the Hotel Traymore, Atlantic City, June 22 to 26, when the preceding nominations will be voted upon.

The nominating committee consisted of the following: J. A. Capp, chief of testing laboratory, General Electric Co., Schenectady, N. Y.; R. L. Humphrey, consulting engineer, 805 Harrison building, Philadelphia; S. T. Wagner, assistant engineer Philadelphia & Reading railroad, Philadelphia; C. D. Young, engineer of tests Pennsylvania railroad, Altoona, Pa.; C. V. Hunnings, chemist and engineer of tests, American Locomotive Co., Schenectady, N. Y., and S. W. Thompson, chemist National Lead Co., Brooklyn, N. Y.

Knocked Out

The supreme court of Ohio on May 4 rendered a decision declaring unconstitutional the Ohio law forbidding the discharge of men on account of membership in labor unions. The court based its decision on a decision of the United States Supreme Court, rendered about a month ago, when the Kansas law, similar to the Ohio statute, was declared unconstitutional.

Institute Directors

New York, May 4. (By wire.)—At the annual meeting Monday James A. Burden, Troy, N. Y., president of the Burden Iron Co., was elected a director of the American Iron and Steel Institute to succeed Ferdinand Roebling, who was not a candidate for re-election. Messrs. J. A. Campbell, J. C. Maben, T. J. Drummond, W. A. Rogers, J. F. Welborn and F. S. Witherbee were re-elected.

Rehearing

Of Sloss-Sheffield Case—Again Submitted to Commerce Commission

Washington, May 4.—The Sloss-Sheffield pig iron case was given a rehearing this week before Examiner A. B. Pugh, representing the interstate commerce commission. All the railoards in Central Freight Association territory indicated that they are ready to join with the southern lines and reduce rates to points throughout that territory. As northern and southern roads were not able to agree as to how the reduction was to be made, the commission was asked to do this for them. After the Central association phase of the case was argued and submitted, the eastern situation was taken up, covering rail and water rates to New York, Boston, Providence and interior points to New York and New England, as well as such water points as Baltimore and Philadelphia. Railroad representatives concentrated their main fight against further investigation as to these sections.

The decision of the interstate commerce commission will be awaited with interest.

Tribute to Littlefield by Davenport

The country's loss by the death of Charles E. Littlefield is very great. He was a rare man, uniting in his personality, physical, mental and moral qualities of unusual strength. Fearless, independent and self-reliant, no one could doubt where he stood on any question, or what he would do when called upon to act according to his conviction. He was a great debater, lawyer and legislator, and it is a pity that he could not have been spared longer to serve the country in his day and generation. By those who knew him best he will long be remembered as a man of high impulses, stainless character, unswerving devotion to principle, and of the greatest intellectual force, and in addition to this sturdy character, of the sweetest and most lovable disposition.

J. W. Deetrick, general manager, the Republic Iron & Steel Co., Youngstown, who recently underwent an operation in a New York City hospital, has returned to his home.

Death of Ex-Congressman Littlefield

Ex-Congressman Charles E. Littlefield, who had been active in labor matters both as a member of congress and later as counsel for employers, died at a New York hospital May 2 as the result of an operation. In 1906, Samuel Gompers stumped the Maine district which Mr. Littlefield represented, in opposition to his election, but the latter was returned. Mr. Littlefield, while in congress, introduced an anti-trust bill which failed of passage in the senate. He resigned from congress several years ago to engage in legal practice at New York City. He was 64 years of age.

Lower Pig Rate

Washington, May 4.—It has just been learned here that the Chesapeake & Ohio and the Southern railroads have reduced their rates on pig iron from furnaces in Virginia to Newport News, and Norfolk, Va., from $1.52½ to $1 per ton, when for export. It is believed that the Norfolk & Western will meet the reduction, which became operative about 10 days ago. Virginia furnace interests believe the reduced rate will open a greater market abroad for them. After the war is ended, they think their furnaces, as well as those of the country generally, will face a tremendous demand for iron.

Central Plant Starts

In the presence of 250 invited guests and accompanied by the blowing of whistles throughout the city, the lighting of the gas of three open hearth furnaces of the Central Steel Co., Massillon, O., May 3, inaugurated the beginning of the manufacture of steel at that plant. The lighting was done by Miss Gertrude Griffiths, daughter of General Superintendent F. J. Griffiths. John P. Neale, formerly of the Carnegie Steel Co., is president.

Rumors of Early Merging

New York, May 5. (By wire.)—Dispatches from Philadelphia state that rumors again are current there of early action in the proposed merger of the Cambria and Pennsylvania Steel companies. Nothing official on this subject is being said, but there may be developments at the annual meeting of the Pennsylvania Steel Co., which takes place next week.

THE OPEN HEARTH

Smaller Floors Vs. Larger Sales

ARE dealers in machine tools gradually forsaking the old custom of maintaining large stocks in commodious display rooms? Broach the subject to ten manufacturers of machine tools, and you will find nine arrayed against the one who upholds the practice.

The nine will point out to you that this tendency is not a matter of recent growth, but has been under way for several years.

The one will emphasize the fact that this tendency has assumed prominence only within the last year or two and is the inevitable result of somewhat slow business conditions.

The minority in the guise of a Cincinnati builder of milling machines and shapers says:

"This tendency toward smaller floors is a natural consequence of bad times and with their passing we will see the big display rooms in evidence again. In dull times, customers 'shop', find fault with what the dealer offers and are very likely finally to decide upon a second-hand tool.

"In good times, they want delivery, and quality is frequently a secondary consideration. For instance, several years ago I had to have a planer in a hurry and took the only offer that promised immediate delivery. It was from a builder, 1,000 miles away, and I rather expected a poor tool. It was all of that. The ways were patched and the tool fell far short of what I would have desired, but I accepted it, as the shop was rushed.

"It's the man with the display and the stock that takes business when times are good."

Now, let the calcium rest upon one of the majority, one of the largest tool builders in the Cincinnati district.

"Our own case," he says, "is ample confirmation of the trend toward smaller floors. The dealers who handle our tools in Boston, New York and Philadelphia, have all given up their down-town rooms and are doing a satisfactory amount of business through the aid of catalogs and demonstrations of the tool in operation in other plants.

"The investment and fixed charges are so much less that the dealer is almost forced into the change. Adequate display space in the down-town high-rent district is in many cases prohibitive owing to its cost.

"Sales are just as easy to make. A prospective customer visits the dealer, under the new order, and is shown a catalog display that will give him a line on what he wants. Instead of visiting a floor full of tools right beside the office, he is whisked by automobile to a warehouse maintained some distance away in the low-rent district. Or, he may be taken to a shop where the tool is operating and witness the machine under actual service conditions.

"The customer is shown as much, or more, with only a little more time taken up in the demonstration. The cost to the dealer is confined to rental for office room, a few cents for gasoline and in case of the larger ones, warehouse rental.

"I think the day of the large floor has passed."

Conditions in Pittsburgh confirm the views of the majority.

Owing to high real estate values, most machine tool dealers in that city rely upon catalogs, detailed drawings and oral descriptions to interest prospective purchasers of new equipment. When possible and convenient, practical demonstrations are given in shops where duplicate installations have been made.

Only three dealers representing builders in out-of-town territory, carry stock machines for display in Pittsburgh. Display rooms almost necessarily are located some distance from the business center of the city, where property values and rentals are reasonable. Two display rooms in Pittsburgh are located in Water street, and the third is 15 or 20 blocks from the commercial and financial center of the city. Builders of heavy rolling mill equipment, for obvious reasons, make no attempt to carry stock displays, either in warehouse or at their plants.

"While we enjoy showing machines to prospective customers, we find it necessary to depend more and more upon the so-called talking qualities of the equipment we handle,"

THE OPEN HEARTH

one Pittsburgh dealer said a few days ago. "Display rooms offer many advantages, but they are almost out of the question in congested cities. There's nothing we like better than a practical demonstration at a shop where satisfactory installations have been made."

What of the Future?

NEXT to getting as much business as is possible in the present, American machine tool manufacturers are most keenly interested in what the future has in store for them. One of the questions now uppermost in the minds of machine tool makers has to do with the possible effect on the future of the industry of the big sales of machine tools now being made, both for export and to domestic manufacturers, for use in making shrapnel and other war materials. In some quarters it is feared much of this machinery will be rebuilt for the second hand market; in others it is contended that due to the severe usage it is receiving a large part of it will be unfit for further use. The answer to this question depends in part on factors which as yet are uncertain, such as the duration of the war, etc. A good deal of the machinery used in making shrapnel and other war material, however, is of a special rather than a general character; then, too, it is being paid for with foreign money. Thus machine tool manufacturers generally seem to have little cause for worry.

On the whole, the machinery trade appears to have good ground to look upon the future optimistically. The present volume of business was entirely unlooked for and under normal conditions would not have come at all. At the same time, general business conditions are showing a tendency toward greater activity. Apart from this, to look to the future in a proper frame of mind, it is only necessary to recall various occasions in the past when unlooked for developments brought great prosperity to the machine tool industry. Such development was the "bicycle craze"; another like it was the "automobile craze". Undoubtedly many industries now in their infancy some day will aid greatly in absorbing the output of machine tool plants. In the machine tool industry as in few others, something always seems to happen when it is most needed, something to upset expectations and bring prosperity to the trade. Who knows but that an "airship craze" may be the next important epoch in the history of the machine tool industry?

He Feared No Man

AT THE recent annual banquet of the American Anti-Boycott Association, in New York, at which a testimonial of $10,000, enclosed in a silver case representing a law book, was presented to Daniel Davenport, the able counsel of the association, the presentation speech in behalf of over 200 members was made by Ex-Congressman Charles E. Littlefield, who said of Mr. Davenport:

"He has discharged the duty imposed upon him by you in fear of the ever-living God and without the fear of man."

More truthful and expressive words cannot be found to describe Mr. Littlefield himself, whose death in New York last Sunday means a great loss to the cause of justice among men. It is customary in some quarters to belittle the services of lawyers in the halls of legislation, but no one is better equipped to serve his country than is the lawyer who, in addition to his legal training, has had practical experience with business and has the courage to defy the unjust demands of the labor agitator. Such a man was Charles Edgar Littlefield, who, while a representative in congress from Maine, stood firm as a rock against all vicious legislation proposed in the alleged interest of the workingman. He was a man of marked ability, integrity and courage. His retirement from congress was a great loss, but he found a field of usefulness and distinction in the metropolis. His unexpected passing away at the age of 64 is deeply regretted by all who knew of his record, and particularly by those who because it had been their privilege to be thrown intimately in contact with him, admired him as a tireless fighter and loved him as a man of highest character. The country needs more men of his type in public life.

Prices Present and Past

Quotations on leading products May 5, average for April, 1915, average for February, 1915, and average for May, 1914. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices May 5, 1915.	Average for Apr., 1915.	Average for Feb., 1915.	Aver. for May, 1914.
Bessemer pig iron, Pittsburgh..	$14.55	$14.55	$14.63	$14.90
Basic pig iron, Pittsburgh.....	13.45	13.45	13.45	13.90
No. 2 Fdy. pig iron, Pittsburgh	13.45	13.45	13.70	14.09
Northern No. 2 Fdy., Chgo....	13.00	13.00	13.00	14.25
Lake Superior Charcoal, Chgo..	15.75	15.75	15.75	15.75
Malleable, Bessemer, Chgo.....	13.00	13.00	13.00	14.25
Southern No. 2, Birmingham...	9.75	9.50	9.50	10.50
Southern Ohio No. 2, Ironton.	12.75	12.75	12.75	13.50
Basic, eastern Pa.....	13.25	13.25	13.50	14.00
No. 2X Virginia furnace.....	12.50	12.50	12.50	12.75
No. 2X foundry, Philadelphia..	14.25	14.25	14.25	14.75
Ferro mang., Balt., (prompt)..	100.00	100.00	68.00*	38.00
Billets, Pbgh.	19.00	19.50	19.50	20.00
Sheet bars, Pbgh.....	20.00	19.60	20.00	21.00
Steel bars, Chicago.....	1.39	1.38	1.31	1.29
Steel bars, Pittsburgh.....	1.20	1.20	1.10	1.15
Iron bars, Philadelphia.....	1.17	1.125	1.12	1.22
Iron bars, Cleveland, local del'y	1.20	1.20	1.15	1.25
Iron bars, Chgo. mill.....	1.15	1.15	1.15	1.10

*Nominal.

	Prices May 5, 1915.	Average for Apr., 1915.	Average for Feb., 1915.	Aver. for May, 1914.
Beams, Chicago	$1.34	$1.36	$1.31	$1.29
Beams, Pittsburgh	1.20	1.154	1.10	1.15
Beams, Philadelphia	1.359	1.30	1.25	1.25
Tank plates, Pittsburgh.....	1.15	1.11	1.10	1.125
Tank plates, Chicago.....	1.34	1.28	1.27	1.29
Tank plates, Philadelphia.....	1.359	1.30	1.25	1.25
Sheets, blk., No. 28, Pittsburgh	1.80	1.80	1.80	1.87
Sheets, blue an., No. 10, Pbgh.	1.35	1.30	1.30	1.37
Sheets, galv., No. 28, Pbgh...	3.40	3.30	3.01	2.80
Wire nails, Pittsburgh.....	1.55	1.59	1.55	1.57
Connellsville fur. coke contr...	1.65	1.65	1.65	2.00
Connellsville fdy. coke, contr...	2.25	2.25	2.25	2.50
Heavy melting steel, Pbgh....	11.75	11.90	11.55	12.00
Heavy melting steel, east'n Pa.	11.25	11.25	9.75	10.75
Heavy melting steel, Chgo.....	9.25	9.30	9.44	9.94
No. 1 wrought eastern Pa.....	12.50	12.50	11.50	12.50
No. 1 wrought, Chgo.....	8.50	8.55	8.88	8.63
Rerolling rails, Chgo.....	10.00	9.85	9.62	11.25
Car wheels, Chgo.....	9.75	9.80	10.00	11.38

(For Additional Prices See Page 946.)

Southern Pig Iron Prices Advance

And More Cheerful Sentiment Prevails in Dixie—April Sales in Chicago Show Large Increase Over March—Some Improvement in Other Centers

Philadelphia, May 3.—A continuation of more widespread interest by pig iron buyers in this territory in connection with some sporadic price advances by Virginia and southern makers furnishes further signs of some betterment in the general situation. Consumption appears to be slowly expanding. The low prices recently made and which still prevail in some directions are the offsetting factors to favorable sentiment among eastern Pennsylvania producers. Individual price advances by several makers which have featured the week include a new schedule on Virginia iron of $13, furnace, for No. 2X; $12.50 for No. 2 plain and $12.25 for No. 3 and lower grades for the remainder of the year by the Virginia Iron, Coal & Coke Co. Other Virginia makers, however, have been selling at the old price of $12.50 for No. 2X and a sale of 1,500 tons to a Richmond buyer was done on this basis. A leading southern maker, after more liberal sales at $9.50, has advanced to $10, Birmingham, for No. 2 for any delivery and has refused offers during the past two or three days at the old figure. Other southern makers are advancing. Eastern buyers, principally pipe works, have been participating in the more active movement of southern iron. A Baltimore pipe foundry closed for about 4,000 tons of Alabama No. 3 at $9, Birmingham, for last half and 1,000 to 2,000 tons of eastern Pennsylvania No. 2X, at around $14.25, delivered; a large pipe maker in this territory bought 1,000 tons of southern for a western plant and is making other purchases; another eastern Pennsylvania pipe shop is figuring on 6,000 tons of low grade for forward delivery. On Northern foundry grades, prices remain at $14 to $14.25, Philadelphia, for No. 2X, with a better miscellaneous demand. Steel making grades show a wider inquiry. A Philadelphia machinery foundry has asked 4,000 tons of standard Bessemer for the next several months. The 3,000 tons basic inquiry from Phoenixville, Pa., for May-July has not been closed. One maker quoted $13.75, delivered, and another $14, on this business. The General Electric Co. recently placed 2,000 tons of low phosphorus with a Lebanon maker. Other sales of 1,500 tons were closed by this seller in the week. Another 1,000 tons of low phosphorus has been sold by an eastern maker for Canadian delivery and other export inquiries are pending, including one for 3,000 tons for Italy, upon which the present ocean freight, 55s, leaves buyers and sellers about 15s apart in their price view.

Buffalo Market Quiet

Buffalo, May 4.—Sales during the week were small and the inquiry for iron in the Buffalo market was light. While an effort has been made since the recent Buffalo drive to hold prices at a $13 minimum for foundry grades for delivery over last half, one of the producing interests has been quoting from $12.50 to $12.75 on the lower silicon irons and states for the present that $13 is a sufficient high maximum for No. 2X foundry. The other interests are holding for $13 to $13.25 on this grade, while one producing interest has booked about all of the iron that it cares to take on for the present. A spread of $1, in the absence of a definite schedule, about covers the range of prices on all grades from $12.50 as a minimum on gray forge to $13.50 as the maximum on No. 1 foundry.

Malleable is holding at $13 to $13.25. There is continued activity in charcoal iron, with prices keeping at $15.75 to $17.25, according to grade

(*For complete prices see page* 946.)

and analysis, while $19 to $20 is being secured on the special brands.

Basic Moderately Stronger

Pittsburgh, May 4.—Demand for steel-making grades of pig iron continues fairly active, but many of the pending inquiries are indefinite. A Sharon consumer has taken 4,000 tons of third quarter basic at $12.65, valley, or 15 cents above the previous market price. The Westinghouse Machine Co. has closed for 4,000 tons of third and fourth quarter foundry grades at about $12.50, valley, for No. 2. Demand for steel making iron for foreign shipment continues heavy, but no additional sales have been made by valley interests. Sales of southern basic the last few days are understood to have involved 50,000 tons for delivery to Mediterranean points, and sales of eastern bessemer for export are described as about equally heavy. Despite activity last month, steel making grades were unchanged in position, according to monthly statistics compiled by W. P. Snyder & Co., whose reports show the average price of bessemer and basic to be $13.60 and $12.50, respectively, at valley points. Neither grade has changed position for three months.

Fair Buying

Cleveland, May 4.—There is fair buying of pig iron in a quiet way and we note the sale of 1,000 tons to a foundry in northern Ohio on the basis of $13, furnace, for No. 2 foundry. Numerous sales of smaller lots were made. Prices in Cleveland and vicinity are well maintained, but concessions are made for distant shipment.

April Sales Exceed March

Chicago, May 4.—Sales of pig iron by Chicago dealers during April exceeded those of March three to five times. March was an unusually light month and the early part of April was equally devoid of important developments, but the latter part of the month, and especially the final week, saw much increase in bookings and the final score brought the total of sales to a more satisfactory figure. One concern finds sales of April this year three times those of the same month in 1914 and about equal to those in April, 1913. However, prices this year were much lower than for either of the other years.

Northern foundry iron of No. 2 grade, containing 1.75 to 2.25 per cent silicon, is being sold at $13, Chicago furnace, for last half delivery. Other sellers are endeavoring to establish $13.25, Chicago furnace, for this delivery and any increase in favorable condition in the market probably will bring all sellers to this level. Inquiry is active and is showing more interest in malleable iron than for some time. One inquiry in hand is for 1,000 tons of malleable for a Chicago melter and another asks for 2,000 tons for a St. Louis concern. Among the remaining inquiry is one for 1,000 tons of high silicon and one for 2,000 tons of foundry iron and several for 1,000 tons of the same grade.

A valve manufacturer, who was inquiring last week for high silicon and foundry iron, is said to have closed for about 1,000 tons of silveries and about 10,000 tons of northern and southern foundry, the tonnage having been divided among at least four sellers. This iron is for delivery during last half.

A feature of the week is the strengthening of quotations on southern iron. Almost all brands represented in Chicago are being quoted at $10, Birmingham, for last half delivery with some sellers willing to take a limited tonnage for immediate shipment at $9.75, Birmingham, and in some quarters $9.50 may still be done for immediate shipment or for future delivery. Iron at the latter price, however, is growing scarcer.

Southern Iron Advances

Cincinnati, May 4. — All Alabama stacks have advanced quotations from 25 to 50 cents a ton, and southern No. 2 foundry iron is now quoted at from $9.75 to $10, Birmingham basis. The former figure is generally given for the third quarter, and the latter for the last quarter of the year. Iron for prompt delivery can be had from one or two sources at $9.50, Birmingham basis. Tennessee iron is quoted at from $9.75 to $10, Birmingham basis, for the last half, with the former figure prevailing in most cases through the entire six months. Southern Ohio iron is not as strong as southern iron, because it has not been selling as heavily as the latter, and is limited to a much smaller territory. The price is unchanged at $12.75, Ironton basis, for No. 2 foundry. No inquiries of importance are before the market, as sales are being made mostly by salesmen purely through solicitation.

Some Improvement

St. Louis, May 4.—The pig iron situation gives evidence of improvement, at least locally. Sales were made last week of 800 tons of southern pig, 150 tons of high silicon, and 150 tons of northern, and inquiries are in the market today for 500 to 1,000 tons of southern No. 3, and 500 tons of southern No. 2. The last inquiry was for 800 tons, but 300 tons were sold today. Southern No. 2 is quoted at $9.75 to $10. Northern iron is offered at $13, Ironton and Chicago furnaces.

South is Cheerful

Birmingham, Ala., May 4.—Birmingham pig iron at last has again reached $10 on some sales and the advance in price has brought optimism to the whole industrial district. Best estimates are that fully 250,000 tons and possibly as high as 300,000 were sold by Birmingham furnace operators during April.

Sales have been so heavy that one maker has temporarily withdrawn from the market, stating that the company has sold up to its capacity and its stocks on hand. The prevailing quotation is $9.75 for No. 2 foundry. One company has closed an order at that quotation for No. 3 and some few sales have been made at $10 for No. 2 for the first time since the war started.

Inquiry still is brisk and the majority of local operators say they can see no reason why the ground gained cannot be permanently held and the improvement continued. One large maker predicts that $10 will be the prevailing quotation within another week.

The new business has been with the general trade as well as the large users of iron. One company sold over 80,000 tons alone during April. Another sales manager states that since Jan. 1 his company has closed orders for over a million and a quarter dollars' worth of pig iron.

Makers contribute the improvement to a realization on the part of buyers that cheaper iron could not be had. Ever since the war started, buyers have been holding off, it is said, and permitting their stocks to dwindle to practically nothing in the hope that the bottom would drop altogether out of the market and they would be able to buy iron at simply their own figures. Thus for months and months they have been holding off until finally the point was reached at which they had to replenish their stocks and the present improvement, which is understood here to be general in all parts of the country, has resulted.

Buying to Sell Later

New York, May 4.—One of the most interesting developments of the pig iron situation in this district in many months is the announcement now made by sellers of the purchase, purely as an investment, of 75,000 to 100,000 tons of various grades by New York City capitalists, who are in no way connected with the iron and steel trade. These sales formed a considerable part of the large volume of quiet transactions referred to in *The Iron Trade Review* a week ago. The

(*For complete prices see page* 946.)

buyers have operated both individually and as a syndicate. They are prepared to carry the iron on the banks of the furnaces or in store for a year or more, if necessary, in the belief that a substantial advance of the present low prices is only a question of time. The financing of the plan is being done partially by the issuance through warehouse companies of warrants against the iron on hand. Both northern and southern foundry and steel-making grades are involved in the sales and the tonnage is to be made up both from iron in stock and from the output of the furnaces over a future period. Some middle western steel-making grades, but little eastern and no Buffalo iron have been a part of these transactions. A purchase several weeks ago for speculative account in the Buffalo district, previously covered, represents an entirely different matter. Sellers are inclined to attach much significance to this investment buying of iron by New York capitalists, as an expression of the confidence of business men in the ability of the market to re-establish itself. Some other good-sized lots of metal, principally southern, have been purchased by iron merchants and a good-sized block of southern iron was taken by a British firm.

Locally, the market has continued to show a fair volume, most of which is being done without general inquiry. A buyer at a sound point closed for 3,000 to 5,000 tons of foundry from Pennsylvania furnaces and a pipemaker took a second block of 5,000 tons of Alabama iron for southern plants. A western Pennsylvania radiator company is out for 1,000 tons or more. Prices in this territory reflect keen competition and are little changed, though some of the Pennsylvania furnaces have been tightening their schedules. Export business has been held up by higher ocean freights, which now are 55s to Italy and about 40s to the British Isles. A shipment of 10,000 tons of bessemer recently sold by a valley maker may be blocked by the inability to get reasonable rates. It now develops that the 6,000 tons of high silicon malleable recently bought by the American Radiator Co. for Hull, England, was taken by a western Pennsylvania furnace instead of a Buffalo maker.

The firm name of the Edgar Allen American Manganese Steel Co., Chicago, has been changed to the American Manganese Steel Co. This company operates foundries at Chicago Heights, Ill., and New Castle, Del., for the manufacture of manganese steel castings.

More Vessels Are Placed

Three More Contracts Made With Eastern Yards—Pennsylvania Distributes Large Tonnage

Philadelphia, May 3.—Another burst of steamship awards resulted the past week in three additional vessels being placed with Atlantic yards, bringing the total of the movement begun some months ago to 31. The Harlan & Hollingsworth Corporation received an 8,400-gross ton tank steamship from the Anglo-Saxon Petroleum Co., a British company, making the third of its type now building for that company at the Wilmington yard, and also a 7,400-gross ton tanker for the Mexican Petroleum Co. The Fore River Shipbuilding Corporation took a tank steamer from the Cuban Distilling Co. Eastern plate makers will furnish about 5,000 tons of plates and Pittsburgh mills about 2,500 tons of shapes for the Anglo-Saxon and Mexican Petroleum boats. The Fore River tonnage has not yet been placed. One estimate of an eastern shipbuilder places the number of boats still in the figuring stage at nine.

The Pennsylvania railroad has distributed orders against its recent inquiries for 20,000 to 25,000 tons of steel, largely plates for 2,100 cars to be built at Altoona, but details are rather vague. The Carnegie, Cambria and a third company, perhaps others, received portions of this tonnage. It it reported that a flat price was made for the time covered which was over the rest of the year. The Reading has placed with two eastern plate makers a small tonnage for locomotives to be built in its own shop. The volume of orders is well maintained with eastern Pennsylvania plate makers with operations at 75 to 85 per cent. There is less talk of price concessions and 1.20c, Pittsburgh, or 1.359c, Philadelphia, represents the market.

Boat to Maryland Steel Co.

New York, May 4.—The Maryland Steel Co., it now is learned, recently was awarded another merchant vessel for the A. H. Bull Steamship Co.; the 2,000 tons or more of plates will go to the Cambria Steel Co. Two other vessels of a similar type were placed by this line with the same yard at different intervals during the past several months, so that the new award increases the total to three. The Maryland Steel Co. now has under contract seven merchant vessels recently taken, the others including three for the American-Hawaiian Steamship Co. and one for the Munson line. A number of other vessels still are in the market. Further subway and elevated railroad sections now coming out along with the activity in marine construction, are the principal sources of plate business at the present time in this district. New business is not brisk, but is better. Specifications are good and prices show reasonable firmness at 1.369c, New York, or 1.20c, Pittsburgh.

Demand Heavier

Pittsburgh, May 4.—The Pennsylvania railroad has informally awarded contracts for a part of material involved in the cars to be built at its Altoona shops, but the details of the order are not known here. Pittsburgh mills will roll about 2,500 tons of shapes for ocean vessels to be built in eastern yards.

Plates are being held at 1.20c by leading makers, but material is offered at 1.10c by at least two mills. Specifications last month were slightly heavier than those taken in March.

Prices Firmer

Cleveland, May 4.—There is considerable activity in light plates in the Cleveland district and prices are firmer with 1.15c, Pittsburgh, as the lowest price available, except, perhaps, on very desirable business, while 1.20c is asked in many cases.

Plates Continue Weak

Chicago, May 4.—Somewhat better tonnage of steel plates is being taken at present, although weakness is still apparent, shading of $1 to $2 per ton under the quotation of 1.39c, Chicago mill, being heard of here and there. Within the past 10 days somewhat better specifications have been received for steel plates, but it is not yet sufficient to satisfy smaller makers and put an end to shading of the quotation.

Boiler Contracts.—The Babcock & Wilcox Co., New York City, through its Pittsburgh office, has taken a contract for 28 850-horsepower Stirling and Babcock & Wilcox boilers of 50 pounds pressure, for Corrigan, McKinney & Co., Cleveland. The Stirling boilers will be used to furnish steam for the blast furnace plant and the open hearth steel department; the Babcock & Wilcox boilers will be used to utilize waste heat for the open hearth furnaces.

(*For complete prices see page* 946.)

Pennsy is Buying Sheets

For Box Car Sidings—Usual Differentials on Galvanized Are Abandoned on Account of High Price of Spelter

Philadelphia, May 3.—About 2,500 tons of No. 12 gage or heavy sheets for box car siding are included in the requirements of car material now being distributed by the Pennsylvania railroad for its Altoona shops. Eastern Pennsylvania makers have been figuring on this business. Sheet orders have been livelier the past week with eastern Pennsylvania makers than at anytime in several months and the tonnage sent to the mills has been the best. Not only are specifications more liberal from various consumers, but there is some supplemental buying under way which has been necessitated because of the fact that users underestimated their forward needs when closing sometime back. Pacific coast orders still are light. Prices are unchanged at 1.459c to 1.509c, Philadelphia, or 1.30c to 1.35c, Pittsburgh, for No. 10 gage blue annealed.

Spelter Boosts Sheets

Pittsburgh, May 4.—Several makers of galvanized steel sheets have advanced prices to 3.60c and above for No. 28 gage because of the high price of spelter, but material continues to be offered at less than 3.40c from certain makers. The American Sheet & Tin Plate Co.'s price is 3.40c for base size. Blue annealed sheets are being held at 1.35c for No. 10 gage. Black sheets are quotable at a spread from 1.80c to 1.90c for base size. The leading interest is operating sheet mills at approximately 70 per cent of capacity.

Sheets Advance

Cincinnati, May. 4.—Galvanized sheets have advanced again, due to the high price of spelter. One large rolling mill in this district is out of the market entirely on this grade, while others are quoting from 3.50c to 3.60c, Pittsburgh basis, for 28 gage. The former price is for immediate shipment, while the latter is for delivery into June. Black sheets No. 28 gage are quoted at from 1.80c to 1.85c, Pittsburgh basis.

Spelter Governs Price

Cleveland, May 4.—On galvanized sheets, the usual differentials have been abandoned on account of the high price of spelter and quotations are based largely on the amount of spelter required for a ton. On the lighter gages, as high as 3.60c, Pittsburgh, is quoted. Reports of price shading below 1.80c, Pittsburgh, on No. 28 black are heard.

Some Out of Market

Chicago, May 4.—With the spelter market emulating a sky rocket, makers of galvanized sheets are not anxious to take business. Consumers of galvanized sheets are equally unwilling to buy at present prices and are being discouraged by sellers in every possible way. The leading independent maker in this territory is entirely out of the market, as it has been for several weeks, and will not take an order under 4.19c, Chicago mill. Even at this price none but a regular customer desiring accommodation would be considered. Representatives of some Ohio mills are willing to take on a limited tonnage at 3.60c, Pittsburgh, and others are asking 3.75c, Pittsburgh, for No. 28 gage.

Black sheets remain steady at former quotations, which are regarded by mill men as too low under the conditions. An increase is noted in the demand for painted sheets and terne plates which are being used in place of galvanized in many places where they will give equal service.

A report that the Inland Steel Co. intends to stop making galvanized sheets is officially denied.

Tin Plate Weaker

Pittsburgh, May 4.—Notwithstanding the fact that the bulk of the tin plate for shipment this season has been sold, concessions are being offered by some makers for prompt delivery. Frequent reports are heard that $3.20 has been shaded for base boxes. Additional tin plate capacity in this district includes 20 mills for the McKeesport Tin Plate Co., McKeesport, Pa.; three mills for the Wheeling Sheet & Tin Plate Co., Yorkville, O., and 10 or 12 mills for the Standard Tin Plate Co., Canonsburg, Pa.

The Pittsburgh office of La Belle Iron Works, Steubenville, O., has been moved from 2320 to 1318 the Oliver building, Pittsburgh.

The E. W. Bliss Co., Brooklyn, N. Y., manufacturer of stamping presses, has established an office and warehouse at 622 West Washington street, Chicago. The growing volume of business of this company in the central west made it necessary to establish this branch, where a line of standard presses and parts will be kept in stock for immediate delivery.

(*For complete prices see page* 946.)

Cast Iron Pipe

Municipal Lettings in East Not Large—Prices Slowly Getting Stronger

New York, May 4.—Newark, N. J., has entered the market for 3,710 tons of class B cast iron pipe, ranging from 6 to 36 inches in size, and for 850 tons of 6 to 12-inch high-pressure pipe. Bids are to be taken on May 6. This is the leading new public proposition offered in the cast iron pipe market in metropolitan and surrounding territory. Municipal lettings continue less voluminous, although the private buying and the general tonnage of the market are well maintained, and producers are feeling more cheerful over the outlook. This latter sentiment is reflected in a gradually stronger price situation. The Warren Foundry & Machine Co. has taken 215 tons of 18-inch for Beverly, Mass., at $22.50, delivered. Bids are going in this week on 880 tons of 6 to 16 and specials for the water department of this city. Bids are in on 285 tons of 4 to 12's for Laurer, Md., but no award has been announced.

More Demand

Chicago, May 4.—Fairly good tonnages of cast iron pipe are being inquired for by municipalities in the west and the cast iron pipe market is looking up. The United States Cast Iron Pipe & Foundry Co. was low bidder last week on 3,500 tons of large sizes for Cincinnati, but the award has not yet been made. Montrose, Colo., will open bids May 6 on 1,500 tons, Highland Park, Mich., May 10 on 600 tons, and Middletown, O., May 7, on 200 tons. Bids were opened May 3 at Detroit for 500 tons of high pressure type and at Morning Sun Ia., on 225 tons.

Shrapnel Order

W. B. Seelig, secretary of the Chicago Pneumatic Tool Co., announces his company has in process of manufacture 100,000 shrapnel shells for European shipment and has received a further order for 300,000 shells upon which work will begin at once. Both orders are sub-contracts from the Bethlehem Steel Corporation.

The Aluminum Co. of America has shifted its New York office from 99 John street to the new Equitable building. It has a suite of nine rooms on the 30th floor of the new building.

Prices for Bar Contracts

On Basis of 1.20c, Pittsburgh, for the Implement Trade from July to January—Some Sales at Higher Prices

Philadelphia, May 3.—Prices on steel bars to the implement trade for the season of 1915 now are being quoted by various makers and these are on the basis of 1.20c, Pittsburgh, for delivery from July to January. The mills this year are willing to quote only six months ahead and the buying after Jan. 1 will follow at later dates, if this plan is maintained. Implement manufacturers in this territory as yet have done little regarding their season's requirements, but they now are expected to take early action. There are more inquiries current at present for third quarter from other buyers including jobbers and manufacturing users and the mills generally have been quoting 1.25c, Pittsburgh, for that period. One small contract was closed on that basis. Specifications and new business are only fair. The requirements for the new Campbell Soup plant near Gloucester will not be ready for figures for some time. Prices show firmness at 1.20c, Pittsburgh, or 1.359c, Philadelphia, for prompt or second quarter.

Steel Bars Active

Pittsburgh, May 4.—Demand for steel bars in April was much heavier than in March and most mills predict tonnages in May will exceed those of the preceding 30-day period. Steel bars are firm at 1.20c for second quarter and 1.25c for third quarter. Agricultural implement makers are expected to figure prominently in the market this month. Mills continue to roll heavy tonnages for the manufacture of shrapnel and other war material for belligerent European nations, but details of such orders are withheld in most instances for obvious reasons. The Westinghouse Air Brake Co. is erecting a number of buildings to fill contracts in the least possible time for about $25,000,000 worth of material. The Westinghouse Electric & Mfg. Co. is reported to be negotiating for buildings owned by the J. Stevens Arms & Tool Co., Springfield, Mass., where, it is said, a large order for one of the allies will be filled. Iron bars are being held at 1.25c by most makers in this district.

Sales at Advance

Cleveland, May 4.—Sales of a considerable tonnage of steel bars have been made for third quarter at 1.25c, Pittsburgh, and fourth quarter at 1.30c, Pittsburgh. For second quarter delivery, 1.20c, Pittsburgh, is being maintained, except on reinforcing bars in competition with re-rolling material.

Steel Bars Firm

Chicago, May 4.—New business in steel bars is not large, although some tonnage is being taken on new contracts to fill out consumers' requirements for the next two months. For the most part, consumers are well covered for the present quarter and tonnages specified during April indicate that most of this steel will be taken.

Interest is being taken by agricultural implement makers in probabilities for requirements during last half and steel makers are holding a firm attitude against making contracts running longer than Jan. 1, 1916. Much work has been done in the past few years to break the former custom of contracting for a full year from July 1, and the probability of success seems stronger now than ever before.

While quotations have not yet been made for last half, it seems probable 1.44c, Chicago mill, will be asked for third and fourth quarter on finished steel products to the general trade, although probably agricultural implement makers will obtain their requirements at $1 per ton less, following the usual trade custom.

Prompt Delivery Urged

Buffalo, May 4.—Mills and agencies in the Buffalo district report that it is becoming more difficult to make deliveries on bar material, and particularly to make them as promptly as customers demand. Prices are being held firmly at 1.20c, base, for second quarter deliveries, with little or no disposition on the part of the producers, up to the present, to quote on deliveries beyond July 1.

Bar Iron Prices Steady

Chicago, May 4.—Bar iron is at a minimum and new business is entirely in small tonnages, the aggregate being sufficient for operations not in excess of 50 per cent capacity. In spite of the slack business conditions, the price remains stationary at 1.15c, Chicago mill, and no producer seems anxious to shade this price in an effort to obtain a larger share of the tonnage.

Hoops, Bands and Shafting

Pittsburgh, May 4. — No change is reflected by the market for hoops or bands which are quoted at 1.25c and 1.20c, respectively. Cold rolled shafting and screw stocks are being held at 68 per cent off by most makers, but some material is being offered at 70 per cent off for immediate acceptance.

(*For complete prices see page* 946.)

Wire Mills

Are Very Busy in Cleveland District—Not Much Buying

Cleveland, O., May 4.—The American Steel & Wire Co. reports that it is operating at about 90 per cent of capacity and is extremely busy in some of its departments. Prices are being well maintained in this district and there is considerable pressure for deliveries, but buying is not such as to test quotations, as nearly all consumers are under contract.

Getting Behind

Buffalo, May 4.—Selling interests in the Buffalo territory report that mills are getting from 30 to 60 days behind in deliveries and that purchasers are pressing hard for material in both wire and wire products. There is no let-up in sight at present for the wire products demand, a considerable portion of which is for export.

Domestic Demand Light

Pittsburgh, May 4.—Manufacturers of wire products are operating plants at practically maximum capacity as a result of heavy orders placed for export since the outbreak of the European war. Domestic demand continues comparatively light and $1.55 seems to represent the market for nails, although new customers are quoted $1.60 a keg. The 60 cent differential for galvanizing is maintained by all makers.

Pipe Advanced

Two Dollars Per Ton—Three Zones for Oil Country Goods

Pittsburgh, May 4. — Iron and steel pipe have been advanced about $2 a ton. The National Tube Co. under date of May 1 sent out new cards showing an advance of $2 a ton on black and galvanized standard pipe and boiler tubes. The National company also has issued new cards on oil country goods for mid-continent, Texas and Louisiana delivery points. Cards provide no increases in price, but delivered quotations are made to three zones instead of one, providing a more equitable arrangement of prices which are based upon actual freight rates. Iron pipe makers have boosted black pipe $2 a ton; galvanized iron pipe under 6 inches has been advanced $4 a ton; galvanized iron pipe over 6 inches has been boosted $2 a ton. Wrought iron boiler tubes have advanced one point or $2 a ton. Steel and iron pipe were advanced Feb. 11. It is understood a large tonnage of steel pipe has been placed with a local maker for western shipment.

Low Phosphorus Scrap

Shows Some Advance in the East—Improvement in Sentiment in Chicago District

Philadelphia, May 4.—Buying of old material in the eastern Pennsylvania field remains in the quiet state of the past several weeks. In some grades, prices have yielded somewhat, but on the whole, the situation is steady and where the demand has been brisk, such as in low phosphorus, advances have been paid. A sale of 1,000 tons of low phosphorus ingot crops was made at $15, delivered, and the producer now has withdrawn from the market. A lot of malleable brought $10, delivered. Heavy melting steel is unchanged at $11 to $11.50, delivered. Some buyers are paying $11.25, delivered, and one or two $11.50, delivered. One small lot was sold this week at $11, delivered. Borings are easier and cast is a little heavy, a sale of heavy machinery for May delivery being done at $12, delivered. Some buyers of No. 1 railroad wrought will pay $13, delivered. The Pennsylvania railroad again is offering 30,000 tons of old rails in connection with its monthly shop list.

Little Buying

New York, May 4.—The old material market practically is marking time in this territory. New buying is modest and there is not much pressure to sell on the part of holders. Prices are a little spotty, as some grades are standing the inactivity better than others. The tone of the market is not in the least unfavorable, as many in the trade feel that the present inactivity is only temporary. Heavy cast appears a little stronger and sales at $12, delivered Jersey points, are noted.

Quiet at Pittsburgh

Pittsburgh, May 4.—The market for iron and steel scrap borders on stagnation. Heavy melting steel is hovering around $11.75. The Pennsylvania railroad is offering material at its several shops in this district. Dealers do not expect to enjoy any improvement until finishing mills increase capacities.

Buffalo Market Active

Buffalo, May 4.—The market is more active in heavy melting steel, machine shop turnings, clean cast borings, bundled sheet scrap and No. 1 and 2 busheling scrap. The continuance of this activity will cause prices of the commodities to stiffen. Canadian interests came into the market for 500 to 600 tons of old car wheels and booked 400 tons at $11.15, f. o. b. Buffalo. This is the largest individual movement of old car wheels to Canadian users in some time. The general tone of the market is reported to be much better.

Demand is Light

Cincinnati, May 4.—The iron and steel scrap market is quiet. Rolling mills are consuming large quantities of old materials, but they bought such large quantities about a month ago, when a good buying movement was realized, that they are now well supplied for some time. Despite the fact that jobbing foundries are supposed to be busy on machine tool castings, they are not buying any scrap. Mixed cast has declined slightly, and is now quoted at from $7.25 to $7.75 per net ton. Other prices are unchanged.

Limited

St. Louis, May 4.—A limited amount of trading in scrap has been done this week, and while prices remain soft, there does not appear to be any tendency toward a further decline at present. Consumers are comfortably filled up with new material, and the indications are that they will not do any extensive buying for the next 30 to 60 days. Railroad offerings before the market are: Baltimore & Ohio, 15,000 tons, of which 3,000 tons are long length steel rails; 1,200 tons of No. 1 railroad wrought, and 1,000 tons of cast iron wheels. Chicago & Alton, 1,000 tons, of which 150 tons are long length steel rails, and 150 tons of No. 2 railroad wrought. Missouri Pacific, 1,200 tons. Vandalia, 500 tons. St. Louis & Western, 100 tons.

Sentiment Better

Chicago, May 4.—Dealers in scrap iron and steel in the Chicago district are feeling much better over prospects, and although demand has not increased, conditions seem to indicate larger transactions within a short time. Quotations remain practically at the level of last week with a few items slightly strengthened and the remainder unchanged.

Railroads are offering about 10,000 tons, the Chicago & North-Western having a list out containing 5,500 tons, of which 1,000 tons are No. 1 wrought, 1,000 tons long steel rails and 400 tons No. 1 cast. The Wabash is asking bids on 2,500 tons, half of which is long steel rails. The Chicago & Alton is offering 1,000 tons, the Soo Line 600 tons and the Grand Trunk 300 tons.

(For complete prices see page 946.)

Coke Prospects

Show Some Improvement—Foundries Contracting in Several Centers

Pittsburgh, May 4.—Connellsville coke oven operators express the hope that prices will stiffen shortly. Scattering inquiries for furnace coke for last half are reported, but no definite line on the future market is available. Outside of purchases by the Pittsburgh Steel Co. the Clinton Iron & Steel Co., details of which are not known, no contracts for future delivery have been placed. Leading foundry coke producers are selling fuel for the year beginning July 1 at a range from $2.40 to $2.50, ovens. The *Connellsville Courier* says production for the week ending April 24 was 299,493 tons, an increase of 1,271 tons over the week before.

Foundries Contract

Cleveland, May 4.—Some Cleveland foundries are contracting for coke for the remainder of the year at $2.40, ovens. A Cleveland firm is sounding the market on furnace coke for a furnace which will probably be blown in at an early date. If the price quoted does not prove satisfactory, the firm will manufacture its own coke.

Foundry Buying Begins

Cincinnati, May 4.—Buying of foundry coke for yearly contracts beginning July 1 has begun, but is very light. Transactions at present are being confined mostly to eastern territory. Foundries in this district are due to purchase the last part of this month or in June. No furnace business is in sight. Quotations on all makes of southern coke remain unchanged.

Ask Investigation

Chicago, May 4. — A formal demand for a congressional investigation of the appointment of Charles Nagel as neutral member of the arbitration board sitting to adjust the demand of enginemen of western railroads for an increase of wages is made in a letter formulated at a secret conference of 100 general chairmen of railway unions held in this city.

The matter also will be discussed thoroughly at the international convention of locomotive brotherhoods at Cleveland, beginning May 12, at which about 900 delegates will be present.

The formal demand for congressional inquiry is in the form of a letter addressed to Warren S. Stone and W. S. Carter, executives of the two brotherhoods.

Rush Orders for Shapes

For Extensions of Plants Making War Materials Feature the Market—More Elevated Work Pending

New York, May 4.—Continued awards of extensions to plants manufacturing war munitions for European belligerents upon which the quickest possible delivery is demanded are one of the interesting features of the structural market in eastern territory. Additional contracts of this character placed in the week call for an aggregate of about 10,000 tons of steel. Official statement has been made by the Crucible Steel Co. of America, however, that its enlargements at Harrison, N. J., are designed chiefly for domestic business. Another Brooklyn elevated railroad section, calling for 14,500 tons of steel, has been offered for bids. The week has produced a fair assortment of miscellaneous awards, in New York City and surrounding territory, and the general condition of the market remains of moderate activity. Slowness in financing of building operations continues an important factor of the situation. On the surface, plain material appears steady at 1.369c, New York, or 1.20c, Pittsburgh, although all reports of price irregularity have not died out. Fabricated quotations show practically no improvement as a result of being based on plain material contracts made some time ago at considerably below the present market.

Quiet Prospects at Philadelphia

Philadelphia, May 3.—Talk is being heard of some large projects being quietly figured in this city, some of which may call for heavy tonnages of steel, but announcements regarding these enterprises are withheld temporarily. The volume of the structural shape market in this and surrounding territory is better, but its general character is largely the same in that most of the current business is coming in small orders. Certain eastern Pennsylvania shape mills booked in April at 80 per cent of capacity and now are running on that basis. This compares with 50 to 55 per cent in March. The recent inquiry of the Pennsylvania railroad for 4,000 to 8,000 tons of shapes, bars, etc., for cars to be built at Altoona has been closed and has been distributed among several makers. Some reports still persist of renewals for second quarter of first quarter contracts being made by certain sellers at 1.15c, Pittsburgh, as late as two weeks ago. Whatever irregularity there is to the market, however, is not of a disturbing character and a fair amount of business is being done at 1.20c, Pittsburgh, or 1.359c, Philadelphia.

Shapes Firm

Pittsburgh, May 4.—Structural shapes are firm at 1.20c for second quarter delivery and the 1.25c figure looms up much stronger for third quarter shipment than previously. While no large contracts for fabricated material are reported, yet inquiries have increased considerably in volume. The Riter-Connelly Mfg. Co. has not lost the contract for the steel involved in the new Schenley high school, 1,300 tons, the general contract for which was declared void by law a few weeks ago.

Active Demand

Buffalo, May 4.—Fabricators in the Buffalo district report that specifications on material under contract and new business are in good volume. The market situation shows a better tone and an improved degree of activity. Requests for early deliveries are coming in. In addition to the increased number of smaller construction jobs looming up, requiring limited tonnages, there are several projects on the boards here and nearing the bid taking point that will require from 300 to 400 tons up to possibly 1,000 tons or over. The Lackawanna Bridge Co. alone has secured in the past 10 days two contracts, taking a total of over 7,000 tons.

More Building

Cleveland, May 4.—Building permits in Cleveland in April amounted to $3,076,335, a gain of $482,470 compared with April last year. The steel tonnage required was not large and structural shops are not busy. No important contracts are pending.

Larger Shape Tonnage

Chicago, May 4.—Increase in demand for structural shapes is apparent, some fairly large tonnages having been closed during the past week and a multitude of small projects calling for a carload or more being placed with various fabricators. Cessation of construction work in Chicago, due to the strike of the building trades, has cut down demand from the city proper, but this appears to be made up by an increased demand from outside territory. Some weakness still prevails, and while larger makers insist on 1.39c, Chicago mill, structural shapes are obtainable from other sources at $1 per ton less.

(*For complete prices see page 946.*)

CONTRACTS AWARDED

Anaconda Copper Mining Co., Washoe, smelter, Anaconda, Mont., 3,108 tons, to Minneapolis Steel & Machinery Co.

Anaconda Copper Mining Co., electrolytic plant at Great Falls, Mont., 1,407 tons, to Worden-Allen Co.

A., T. & S. F. Ry. Co., two 100-foot turntables, one at Amarillo, Texas, and one at Wellington, Kans., 230 tons, to American Bridge Co.

Dallas Union Terminal Co., train sheds, Dallas, Tex., 215 tons, to American Bridge Co.

Addition to Metropolitan Building, Denver, Colo., 202 tons, to Patterson-Burghardt Construction Co.

Wisconsin & Northern R. R. Co., one 261 foot deck plate girder viaduct, Gresham, Wis., 134 tons, to Wisconsin Bridge & Iron Co.

Link-Belt Co., pattern shop and storage building, Chicago, Ill., 109 tons, to Butler Street Foundry.

Extensions to Atha plant of Crucible Steel Co. of America, Harrison, N. J., 2,500 tons, awarded American Bridge Co. Later awards expected to bring the total to 4,000 to 5,000 tons.

Apartment for Bing & Bing, East Fiftieth street, New York City, 200 tons, awarded Passaic Structural Steel Co.

Bridge work for Pennsylvania railroad, 250 tons, awarded McClintic-Marshall Co.; 415 tons, for this system, still in the market.

Further extensions to the plant of the Bridgeport Arms Co., Bridgeport, Conn., 3,500 tons, awarded, of which 2,100 tons went to the Pennsylvania Steel Co. and 1,400 tons to the Phoenix Bridge Co.

Extensions to the plant of the Scoville Mfg. Co., Waterbury, Conn., 3,600 tons, of which 2,100 tons went to the McClintic-Marshall Co. and 1,500 tons to Levering & Gerrigues.

National Bank building, Springfield, Mass., 900 tons, awarded Levering & Gerrigues, by Hoggson Bros., general contractor.

Loft building for the Hampton Shops Co., Fiftieth street, New York City, 600 tons, awarded W. B. Shafer Co.

Loft building, East Thirtieth street, New York City, for the Forty East Thirtieth Street Co., 700 tons, awarded Hinkel Iron Works.

Two bridges for Buffalo, Rochester & Pittsburgh railroad, 300 tons, awarded American Bridge Co.

Bridge work for Central Railroad of New Jersey, at Easton, Pa., 500 tons, Phoenix Bridge Co. low bidder and will receive award.

Small sections for Manhattan Elevated Railroad work, New York City, 2,200 tons, recently placed by the T. A. Gillespie Co., now learned were taken by the Phoenix Bridge Co.

Anaconda Mining Co., new smelter, Great Falls, Mont., 3,000 tons, contract to Lackawanna Bridge Co., Buffalo.

CONTRACTS PENDING.

Public bridges of Strauss bascule type at Elizabeth, N. J., Cape May and Sea Isle, N. J., about 500 tons; bids being taken.

Office building for International Correspondence School, Fortieth street and Broadway, New York City, 1,000 tons; bids being taken.

Wheelock loft building, East Thirty-third street, New York City, 1,200 tons; revised and again offered in market.

Section No. 2 at Gravesend avenue, for the Culver elevated railroad line, Brooklyn, 14,500 tons; bids asked for May 18.

Ferro Advance

Of Ten Dollars Per Ton is Virtually Nominal, as No Sales Are Made

New York, May 4.—From the fact that buyers have liberal tonnages under contract both as the result of original purchases made months ago and of additional lots taken recently under merging arrangements, the advance of $10 a ton on ferro-manganese to $88, seaboard, announced by English makers on April 30, remains for the time being a practically nominal figure. This price is quoted for such deliveries as sellers prove able to make. No sales at the advanced price have been made and the best market opinion is that few can be expected for some time due to the well-covered condition of buyers and to the incoming shipments against old commitments.

It has been announced by the English makers, however, that any old contracts which as yet have not been "married" to new tonnage, must be taken at the $88 price. There are some tonnages of this kind still outstanding, owing to the objection of several steelmakers to subscribing to certain clauses of the pledges against the exportation of steel. A new angle regarding these pledges developed in the week, when it was announced that written agreements signed by the officials other than the presidents of the respective purchasing companies, are not acceptable to the British government. Many of these pledges have been signed by purchasing agents, vice presidents and other officers, apart from the president. It now is required that all such agreements must be resigned by the president. Efforts continue to be exerted to bring about some modification of the drastic clauses of the pledges.

The $10 advance just quoted by English makers is the second of that amount to be announced since the embargo on shipment of ferro-manganese to this country was imposed by the English government last November. When shipments were stopped the official market was at $68, seaboard. On March 3, it was raised to $78. The advance late last week was not unexpected, for as previously stated in *The Iron Trade Review*, sales recently have been made by English makers to nearby countries at considerably higher figures. A scarcer and dearer condition of manganese ore continues.

Further shipments of ferro-manganese from England to reach this country within the past week aggregated about 1,200 tons. These included the Quernmore at Baltimore, with 750 tons, and the Chancellor at New Orleans, with 400 to 500 tons. The Asian is due at New Orleans with 400 to 500 tons. The Appenine, which, as far as known, has the largest single lot afloat, is expected to reach eastern ports at the end of the present week.

Spiegeleisen is more buoyant and domestic material to the amount of 1,000 tons or more was sold to home buyers in the week at around $27, furnace, for 19 to 21 per cent. It is believed that further price advances are in sight.

In the ferro-silicon market, an interesting development is the offering in this country within the past week or two of Swedish 50 per cent. The prices named on this metal have been the same as those quoted on domestic material, or $71 to $73, Pittsburgh or Philadelphia.

Ferro Prices Higher

Pittsburgh, May 4.—Ferro-manganese dealers at this city have not received detailed information about the advance for this alloy reported a few days ago in the east. Material is being held at $88, seaboard, or $10 a ton above the previous prices for forward delivery. No sales of importance are noted. The market for lower grades of ferro-silicon is not so active as it was a fortnight ago and sellers are considering trying to establish prices at higher levels. No change is noted in the market for ferro-tungsten, ferro-molybdenum or ferro-vanadium, which continue to range from 8c to 12½c a pound, according to tonnage.

Warehouse Business Improves

Cleveland, May 4.—Cleveland warehouses report satisfactory business, with April having made a better showing than March, which made a comfortable gain over February.

Nuts, Bolts, Rivets

Pittsburgh, May 4.—Specifications for nuts, bolts and rivets in April were slightly heavier than those received in March, leading makers report. Moderate improvement in prices also is reported. Prospective car buying is encouraging to rivet makers.

Relining Furnaces.—J. W. Rinehart, Youngstown, O., has just finished relining Shenango furnace No. 3 and has taken a contract to reline Star furnace, Jackson, O. Shenango furnace will blow in May 10.

(*For complete prices see page* 946.)

Price of Spelter

Is Still Advancing—Heavy Sales of Zinc O e at High Prices

New York, May 4.—The price of spelter continues to advance and the last price done on spot prime western was 15c, delivered in the east, equivalent to about 14.80c, St. Louis. Several sellers now are making offers of delivery within the next week or 10 days, in carload lots, at about this figure, and some are asking higher. One is asking 15.50c, delivered in the east. One of the important developments of late is the greater willingness of consumers to buy futures. A factor which is becoming rather serious is the zinc ore situation. There have been heavy sales of zinc ore lately and prices are high. The miners are well sold and some of the producers of spelter are wondering whether or not they will have any difficulty in closing for their ore supplies. These interests, naturally, are not making any sales of spelter in the meantime. There have been sales of brass special spelter at nearly 17c, St. Louis, as far ahead as September. Sheet zinc has been advanced to 17.50c.

Demand for copper has fallen off and the market is a shade lower. There is no weakness, however, as first hands are too well sold ahead to want to exert any selling pressure. Electrolytic is held by first hands at 18.75c to 18.87½c, delivered 30 days, while second sellers offer small quantities at 18.62½c to 18.75c. Casting copper is quotable at 18.37½c to 18.50c, delivered 30 days. Prime lake is quoted at 19c, cash. The best brands are held at 23c to 24c, cash, while arsenical lake is obtainable at 18.75c to 18.87½c, cash.

The lead market has been somewhat more active during the week; some good sales were made and some good inquiries are pending. There is little foreign demand at present. The leading producer still asks 4.20c, New York, but an advance is expected. The outside market is quoted at 4.10c to 4.12½c, St. Louis.

H. L. Barnitz, sales agent of the International Oxygen Co., 115 Broadway, New York, has recently closed with the Tokio Electric Co., Tokio, Japan, for a large installation of the I. O. C. cells for the production of oxygen and hydrogen gas. This is one of several foreign installations made by him.

The Pittsburgh offices of M. A. Hanna & Co., Cleveland, in charge of B. S. Stephenson, have been moved from 1844 to 1445 the Oliver building.

Orders of Great Volume

Are Reported and it is Probable That Large Equipment Contracts Will Be Placed by Foreign Buyers

New York, May 4.—Reports of enormous orders and inquiries for rolling stock, rails and other railway supplies for Russia have attracted much attention in the week. As yet, most of these matters are only in the form of reports and some of them are of such extravagant size as to challenge credence, but it is learned a few of these negotiations appear to be soundly based and the high standing in the business world of some of the companies directly interested in them suggests the likelihood of important developments. One report has had it that the Pressed Steel Car Co. finally has taken a very large equipment order for Russia which some of the estimates place in excess of $25,000,000 in value. The Pressed Steel Car Co. states that it is not able to confirm officially this report, but it is known the company has been figuring actively on large inquiries which Russia had out recently in various forms and its representatives now are on the ground there. Another matter that has been brought to the attention of manufacturers is the possibility of a requirement of 1,000,000 tons of rails of four different sections, 50,000 car wheels and similarly large requirements for Russian roads. The French government has inquired for 25 to 50 locomotives for the Paris-Orleans line, which is in addition to the 100 recently circulated. An inquiry for 1,000 kegs of standard spikes daily for export has appeared and this is believed to be for the British government. The Jones & Laughlin Steel Co. has taken 1,000 kegs of spikes for the Panama canal.

Domestic car and locomotive orders remain light. Bids on the large Pennsylvania inquiries are due this week. The inquiry in the open market for 50 locomotives, has been increased to 75.

Pennsylvania Inquiry

Inquiries now have been issued by the Pennsylvania railroad for 138,000 tons of steel rails, which will represent the main block of its 1915 requirements. This quantity, with the 12,000 tons in trial lots, previously rolled, will make the total of the year's order to date 150,000 tons. Additional tonnage may be placed later in the year. Early action on the present inquiry is foreshadowed, as the mills are to submit bids by Friday of this week. In addition to the railmakers in this country, the Algoma Steel Co. has been invited to bid upon the inquiry.

Of the 138,000 tons now in the market, 73,000 tons, including 30,000 tons of 125-pound sections, are for the lines east and 65,000 tons for the lines west. The specifications under which these rails will be rolled are substantially the same as those followed by this system in recent years. The feature recently tested out of allowing the bloom to cool to atmospheric temperature before the final passes, has been eliminated. An interesting new point, however, is that prices are asked on a moderate quantity of 45 and 60-foot lengths, as against the standard length of 33 feet. The Havana Central has placed 1,000 tons of rails with the Pennsylvania Steel Co.

Car Wheels Advanced

Pittsburgh, May 4.—Thirty-three-inch freight car wheels have been advanced $1 and are now listed at $16, and 36-inch passenger train car wheels have been boosted $1.50, now being named at $22.50.

Railway Buying Better

Chicago, May 4.—Railways continue to specify liberally against their contracts for track fastenings and this is one of the most active departments in the steel market. Indications are that some larger things are about to come out and steel makers are awaiting anxiously their development. Buying is expected shortly to include considerable tonnages of rails and larger requirements for new cars than have been evident for some time.

Billets Needed

By British Users and Inquiry Continues in Spite of High Freights

Philadelphia, May 4.—Continued rise in ocean freight rates on semi-finished steel, which now are 40s 5d to 42s from eastern ports to the British Isles, has not deterred the inquiry of buyers there for American billets and other forms. Some additional good tonnages were offered in the week. Sellers of steel in this district generally continue willing only to quote approximately domestic prices at seaboard with freight to the account of the buyer and have steadily been making sales under such an arrangement, indicating that British buyers manifestly are in urgent need for steel from this side and will pay the terms. A sale of 150 tons of wire rods was made to Australia this week. The domestic market is only moderately active, but prices are well maintained at $19.50, Pittsburgh, or $22.06, Philadelphia, on rolling billets and at $3 to $4 higher on forging billets.

Semi-Finished Hold

Pittsburgh, May 4.—The market for semi-finished steel products is quiet, but prices seem to be fairly well maintained. Sales of forging billets at $26, Pittsburgh, are reported. New demand for both billets and sheet bars is light. Muck bar is named at $27 and wire rods at $25, Pittsburgh.

Ore Shipments

Show Increase, Owing to Greater Activity of Steel Corporation Fleet

Cleveland, May 4.—Buying of iron ore by merchant furnaces proceeds very slowly owing to the fact that many furnaces are out of blast and stocks of ore on hand at most stacks are ample for several months' requirements.

The very large gain in ore shipments in April is due principally to the greater activity of the Steel Corporation at Duluth and Two Harbors. It is probable that the action of the interstate commerce commission in reducing the ore-carrying rate from mines on the Mesabi to upper lake ports 5 cents per ton will have a tendency to delay shipments somewhat until the reduction becomes effective June 15.

Ore shipments during April were 503,832 tons as against 269,686 tons for April, 1914, an increase of 234,146 tons. It is expected now that the May movement will be fair. Shippers in general have lined up considerable business for their own fleets and outside vessels may get cargoes before the month is over. Following were the shipments by ports during April:

Port.	April, 1914.	April, 1915.
Escanaba	110,729	49,307
Marquette	.....	4,438
Ashland	40,838	43,949
Superior	62,338	87,175
Duluth	.....	174,989
Two Harbors	55,781	143,974
Total	269,686	503,832
1915 increase	.....	234,146

Have Little Interest

Philadelphia, May 4. — Eastern furnacemen have shown small interest in Lake Superior iron ores or in the recent sales which have fixed the market for this material upon the same basis as prevailed in 1914.

HOW DODGE BROTHERS PLANT WAS REORGANIZED

This article, by H. Cole Estep, tells how a great manufacturing establishment, turning out certain automobile parts, was enlarged, transformed and re-equipped in less than six months to manufacture a complete automobile, none of whose parts were similar to those which had been produced. The methods which are described are of special interest because a large number of concerns in the iron, steel and metal-working fields recently have been obliged to radically change the character of their products in order to meet new business conditions. At the present time, we find steel car companies manufacturing shrapnel and howitzer shells; agricultural implement makers are turning out gun carriages; makers of shafting are forging heavy guns and builders of planers and certain other machine tools have abandoned their regular line of work to manufacture parts for lathes, milling machines, etc. Also, the output of many other establishments, for reasons not directly connected with the war, is being radically changed and modified. This article affords an unusual insight into the problems which must be solved in order to successfully shift a manufacturing plant from one line of work to another in a comparatively short time.

TO take a large manufacturing plant, employing 5,000 men on a certain class of work, and in six months transform and re-equip it for an enlarged output on a different class of work, involving the augmentation of the working force by over 30 per cent, the complete re-design of hundreds of special jigs and machine tool fixtures, the construction of a number of new buildings and the organization of several additional departments is a feat that lies beyond the scope of ordinary manufacturing. Yet this is what has been accomplished by Dodge Brothers, automobile manufacturers, Detroit. In addition, the business has been shifted from a wholesale to a retail basis; where formerly the concern sold its product in such large quantities to but one or two customers that a sales department was unnecessary, today it is distributing complete automobiles through a large number of representatives to individual purchasers throughout the world.

FIG. 1—TREMENDOUS PRESSES WERE PURCHASED AND SPECIAL DIES MADE FOR FORMING THE REAR AXLE HOUSING

Until July, 1914, Dodge Brothers were engaged exclusively in manufacturing rear axles, transmissions, forgings and certain other important parts for one of the most widely known low-priced motor cars. Today the same concern is making and selling a complete automobile of an entirely new design. Deliveries on the new car did not commence until early in December, but two months later the production had reached 100 cars a day, and by midyear it will have ascended to 250. Of necessity, this transformation has involved the solution of many important manufacturing and administrative problems, some of which it is hoped to outline in this article. The success which has been attained has been due largely to the fact that the details were worked out according to a definite plan and false moves were eliminated. First the general type of car to be manufactured was determined upon and the details of the design were established. Then the necessary steps in arranging the plant for the manufacture of the car were carefully worked out and the whole program carried into reality. Definiteness of purpose is evident throughout the entire organization. As one of the executives of Dodge Brothers expressed it: "We planned the whole

FIG. 2—A LARGE NUMBER OF SPECIAL PORTABLE BENCHES WERE DESIGNED FOR ASSEMBLING MOTORS

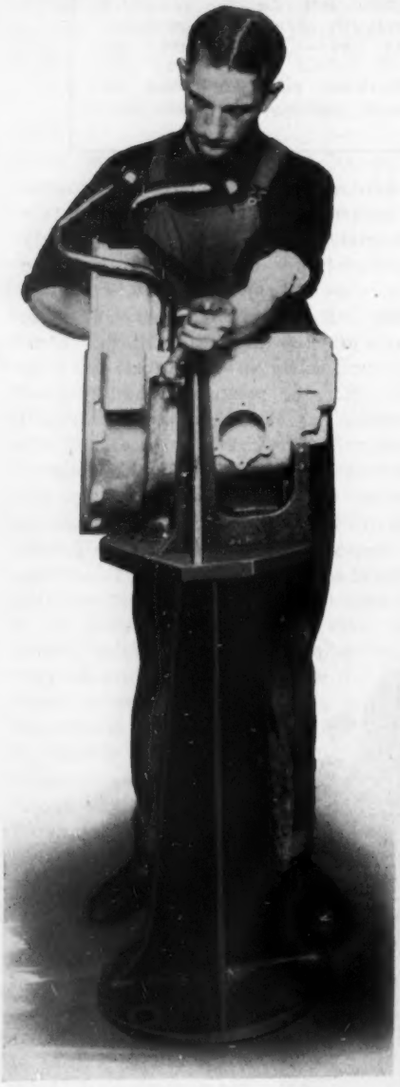


FIG. 3—ONE OF THE MANY CAST IRON STANDS USED FOR ASSEMBLING PURPOSES

thing out; we first knew what to do and we went ahead and did it." Guesswork was avoided. In other words, without taking the trouble to affix a label, Dodge Brothers have accomplished their results through the correct application of the principles of scientific management.

Until July, 1914, when the contracts then in existence expired, the Dodge plant, as suggested previously, was devoted entirely to the production of certain important automobile parts for one of the most prominent motor car manufacturers in Detroit. Complete transmissions of the planetary type, rear axles and steering devices were constructed and assembled, involving casting, forging, machining and assembling operations. In addition, front axles, steering knuckles, connecting rods, crank shafts and other automobile drop forgings were produced, about two carloads being shipped daily. About 30 tons of brass castings, including principally bushings, were manufactured and shipped every day together with 80 tons of

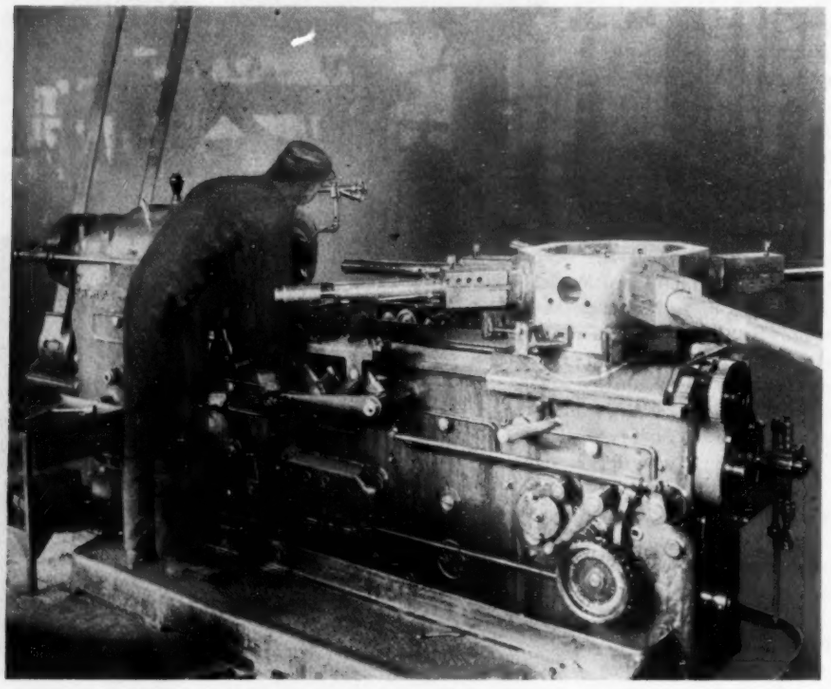


FIG. 4—LARGE SEMI-AUTOMATIC TURRET LATHE PROVIDED WITH SPECIAL FIXTURE FOR MACHINING REAR AXLE HOUSINGS

FIG. 5—A SECTION OF THE BRASS FOUNDRY FOR WHICH NEW PATTERNS, CORE BOXES, ETC., WERE PROVIDED

iron castings, including such parts as fly wheels, circulating water connections, etc.

To appreciate the significance of this output it must be realized that these parts were produced in tremendous quantities. For instance, in April, 1914, rear axles were made and assembled at the rate of 1,640 complete sets per day, while at the same time, 1,345 transmissions, about 1,200 fly wheels and over 4,000 connecting rods, together with innumerable bushings, small forgings, etc., were turned out. Some further figures regarding the capacity of the Dodge plant previous to taking up the manufacture of the new car may be of interest. One of the largest gear-cutting establishments in the world was operated with a capacity of approximately 34,000 gears per day. The heat treating department consumed about 10,000 pounds of potassium cyanide per week. Some of it was utilized in hardening the 6,750,000 clutch disks which were turned out annually. A daily production of 1,400 crank shafts in the

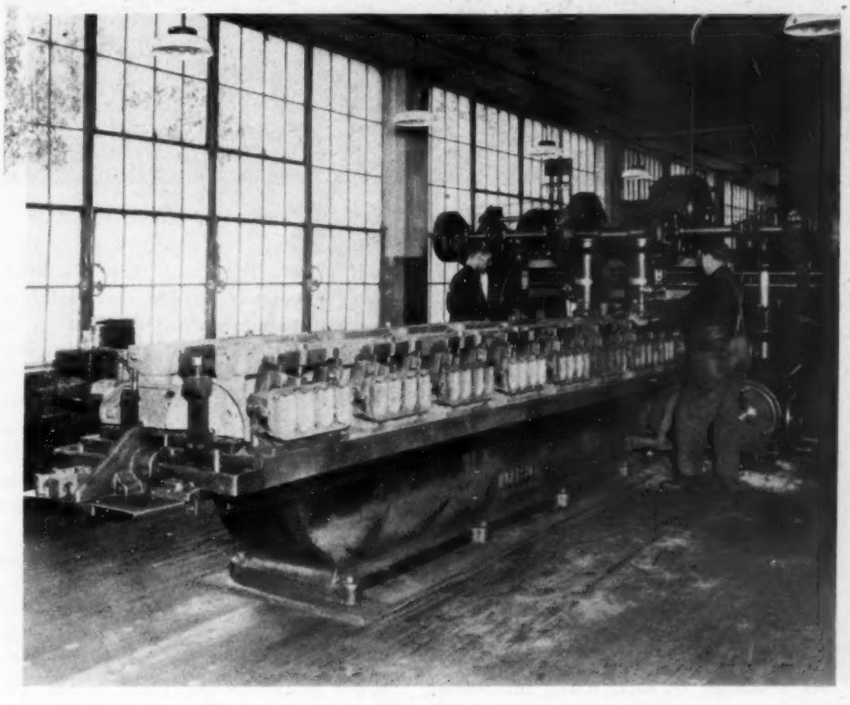


FIG. 6—ONE OF THE FOUR-SPINDLE MILLING MACHINES PURCHASED FOR MACHINING 18 CYLINDERS AND CYLINDER HEADS IN ONE OPERATION

FIG. 7—ASSEMBLING REAR AXLES ON A SPECIALLY DESIGNED CAST IRON STAND

drop forge department was not unusual. In fact about 300,000 pounds of steel were forged and treated during every 10-hour working period. In the forge and heat-treating furnaces 3,000,000 gallons of crude oil were consumed annually and 25,000 tons of coal also were required.

This will give some idea of the exceptional facilities which the Dodge organization found at its disposal when the manufacture of the new car was commenced. At the same time it gives the reader a conception of the magnitude of the task involved in shifting from one line of production to another. Dodge Brothers found it essential to go into the manufacture of automobiles on a large scale in order to employ their equipment adequately, but at the same time the difficulties to be surmounted were multiplied and there was too much at stake to permit of many mistakes or experiments. A manufacturer starting in to make a few cars a day can afford to take some chances and work out his design as he goes along; this is not the case, however, when production is to run into big figures the first year.

From the foregoing, it is evident that even previous to the recent extensions, the Dodge plant was unusually large. Briefly it included a gray iron and brass foundry; extensive blacksmithing, drop forging and heat treating departments, together with a large machine shop, assembly quarters, a power plant and auxiliary facilities. The accompanying plan, Fig. 9, shows the general arrangement of the plant. The older departments are indicated in outline and the new additions are shaded. The gray iron and brass foundries, it will be noted, form a structure 140 x 400 feet. The heat treating and drop forge shops are each 70 x 400 feet, and the smith shop is 60 x 400 feet. The machine shop consists of two wings, each 65 x 400 feet, four stories in height. This, together with storage sheds, the power house, office and other auxiliary structures, made up the plant as it existed previous to the decision to go into the manufacture of complete automobiles. About 5,000 men were employed, and the plant had a physical valuation of from $2,000,000 to $3,000,000.

It is not necessary in this connection to go into the details of the production methods of Dodge Brothers. The figures given above covering the quantity of parts turned out indicates that they must be satisfactory from a commercial and mechanical standpoint. As a matter of fact, many interesting methods and appliances are employed. For instance, the flash from the drop forgings are assembled in a yard under a heavy gantry crane where they can be economically handled by a magnet.

Materials are handled in an economical and efficient manner. The buildings have broad aisles with wide shipping platforms, together with big elevators, making it possible to employ standard motor trucks for inter-departmental transportatton. Eight five-ton trucks and four 1,000-pound motor wagons are utilized, supplemented by an extensive system of telphers and traveling cranes. Over 1,200 steel barrels are used for shifting small parts. Even with these facilities, it was necessary to add materially to the existing equipment in order to be in a position to manufacture complete motor cars in large quantities on a satisfactory basis. At the outset, an experimental department was necessary to work out the details of the new car. Additions to the tool-making department also were demanded to provide the hundreds of new fixtures that were necessary. Among the other departments added were an aluminum foundry, a carpenter and pattern shop, a tin shop, a press shop for stamping axle housings, frames, etc., a body-building plant, a top and trim shop including an upholstery

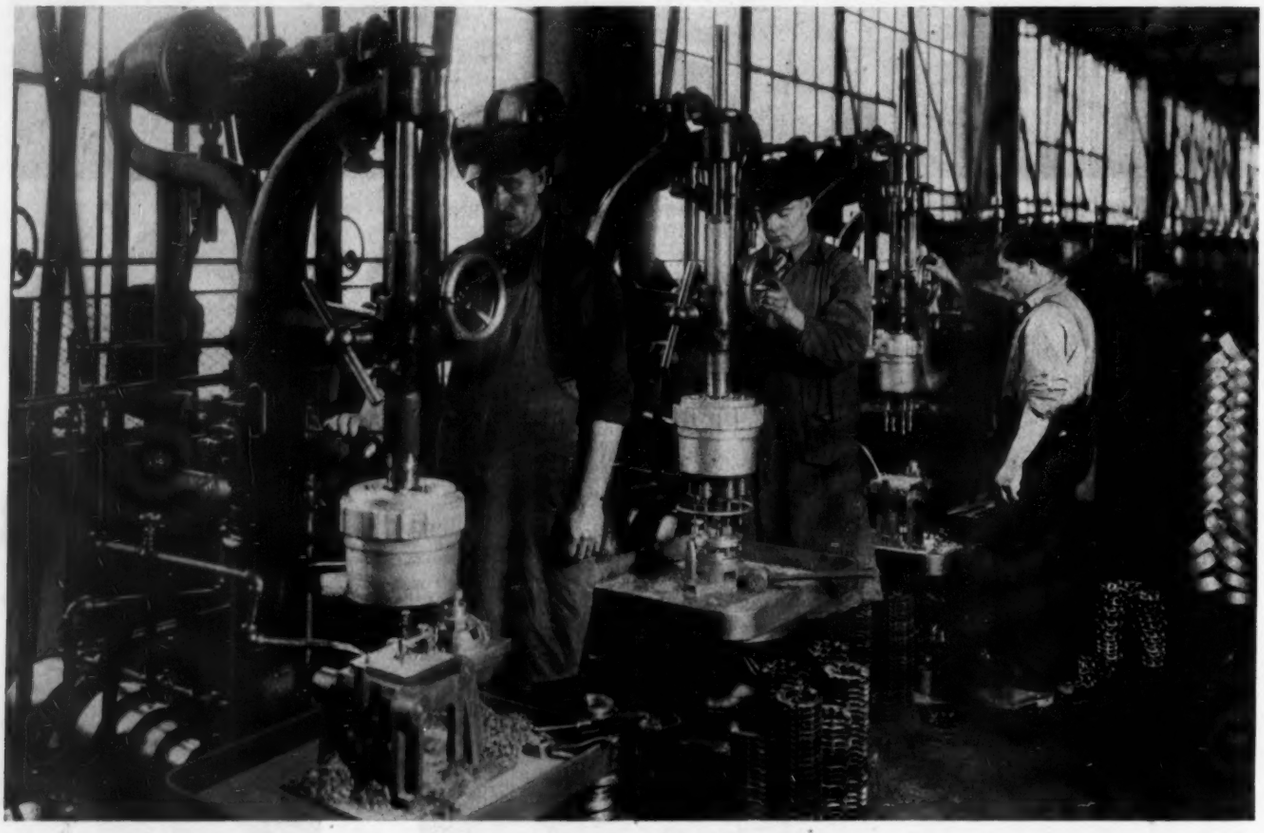


FIG. 8—A FEW OF THE HUNDREDS OF SPECIAL DRILLING HEADS DESIGNED TO MAKE PARTS FOR THE NEW CAR

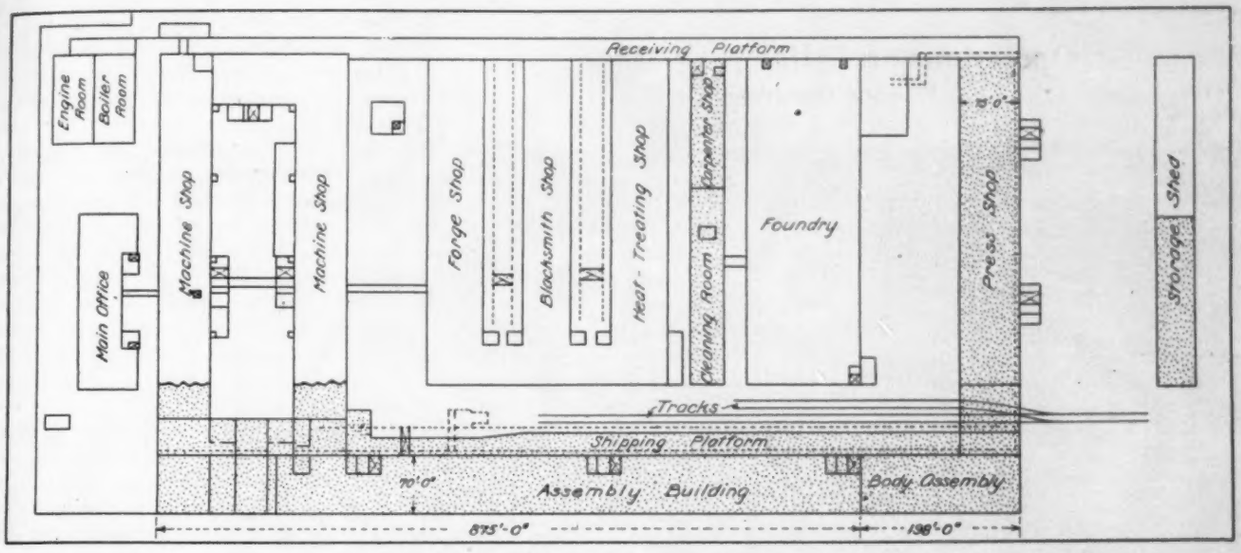


FIG. 9—PLAN OF DODGE BROTHERS PLANT—THE RECENTLY ADDED PORTIONS ARE SHADED

department, a radiator shop, motor assembly and testing departments, including facilities for ignition and starter assembly, a wheel shop with suitable equipment for painting and assembling, chassis and final assembling departments, together with inspection, testing and shipping facilities. Among the new structures that were added, practically all within six months, are the following: An assembly building, 70 feet in width, 876 feet in length and four stories high; a sheet metal or body building shop, 75 feet wide, 600 feet long and four stories high, with an L connecting with the assembly building, 198 feet long and 70 feet wide; an addition to the brass foundry for cleaning purposes, 40 feet wide and 175 feet long, one story; and a carpenter shop, 40 x 160 feet, four stories. A shipping platform served by a traveling crane also was built along the full length of the inside of the assembly building, as shown in Fig. 9, and extensive additions were made to the facilities for the storage of rough and finished parts. Large quantities of new tool equipment were bought for the new departments. One of the several presses pur-

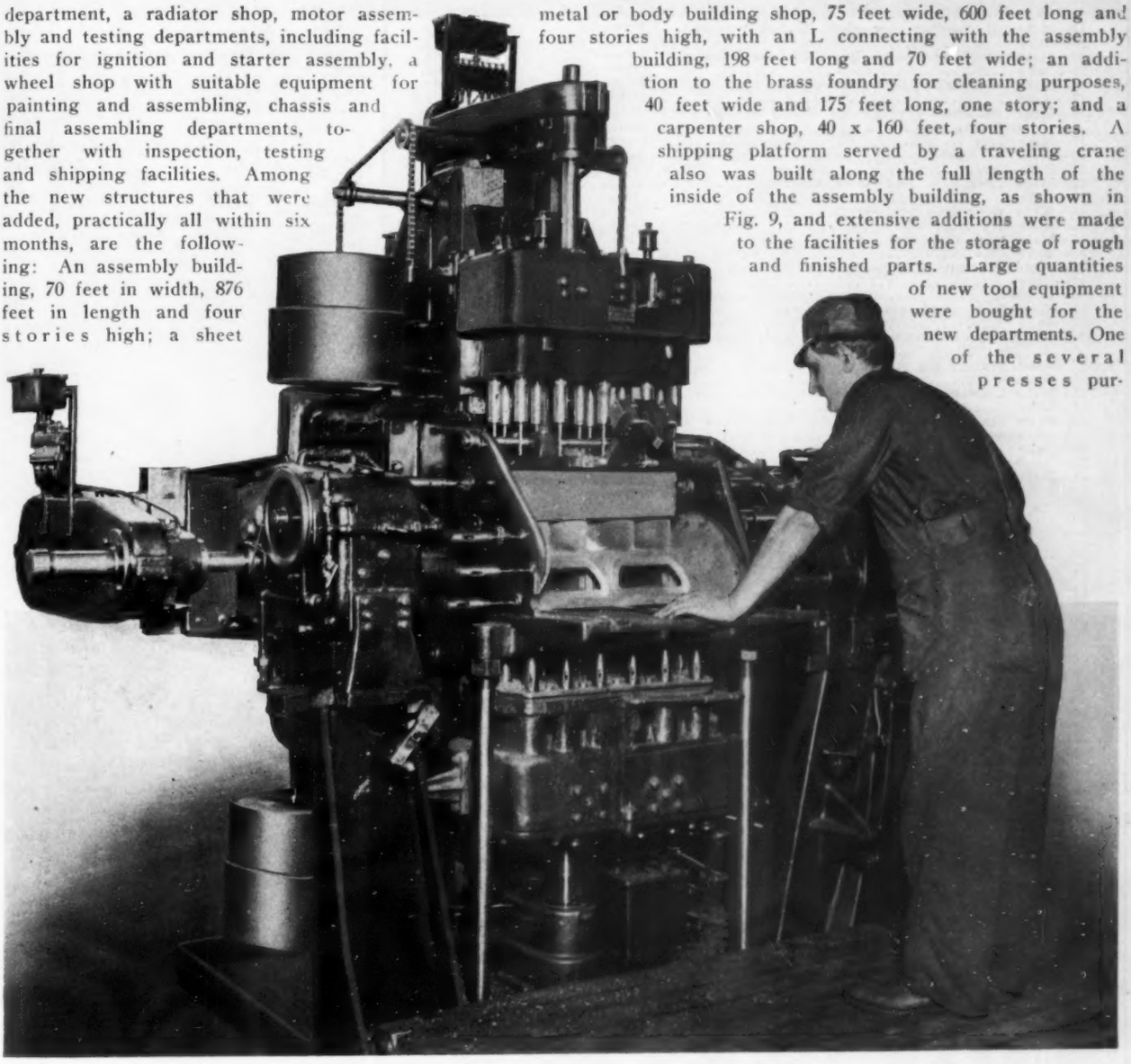


FIG. 10—SPECIAL FOUR WAY DRILL PRESS DESIGNED TO DRILL 54 HOLES AT ONE SETTING

Operations on Cylinder Casting

Foundry Operations

Operation No.	Description of Operation.	Tool used.	Dept.
1	Make outside core R. H.	Core Machine	G. I. Fdy.
2	Bake core	Oven	G. I. Fdy.
3	Blacken	Bench	G. I. Fdy.
4	Jig core	Jig stand	G. I. Fdy.
5	Make outside core L. H.	Core Machine	G. I. Fdy.
6	Bake	Oven	G. I. Fdy.
7	Blacken	Bench	G. I. Fdy.
8	Jig core	Jig stand	G. I. Fdy.
9	Make water jacket core—bottom	Core Machine	G. I. Fdy.
10	Bake	Oven	G. I. Fdy.
11	Jig core	Jig stand	G. I. Fdy.
12	Make water jacket core top	Core Machine	G. I. Fdy.
13	Bake	Oven	G. I. Fdy.
14	Jig	Jig stand	G. I. Fdy.
15	Make water jacket strip—intake pipe core	Bench	G. I. Fdy.
16	Bake	Oven	G. I. Fdy.
17	Jig core	Jig stand	G. I. Fdy.
18	Make water jacket core—center	Bench	G. I. Fdy.
19	Bake	Oven	G. I. Fdy.
20	Jig core	Jig stand	G. I. Fdy.
21	Make intake manifold core	Bench	G. I. Fdy.
22	Bake	Oven	G. I. Fdy.
23	Jig core	Jig stand	G. I. Fdy.
24	Paste core	Bench	G. I. Fdy.
25	Paste all the above cores together	Bench	G. I. Fdy.
26	Bake	Oven	G. I. Fdy.
27	Finish cores	Bench	G. I. Fdy.
28	Bake	Oven	G. I. Fdy.
29	Make flywheel housing core	Core Machine	G. I. Fdy.
30	Bake	Oven	G. I. Fdy.
31	Blacken	Bench	G. I. Fdy.
32	Make oil chamber core—flywheel and bearing	Bench	G. I. Fdy.
33	Bake	Oven	G. I. Fdy.
34	Make oil chamber core—gear case end bearing	Bench	G. I. Fdy.
35	Bake	Oven	G. I. Fdy.
36	Make oil chamber core—center bearing	Bench	G. I. Fdy.
37	Bake	Oven	G. I. Fdy.
38	Make oil chamber core—camshaft bearing front and rear	Bench	G. I. Fdy.
39	Bake	Oven	G. I. Fdy.
40	Make oil chamber core—camshaft bearing center	Bench	G. I. Fdy.
41	Bake	Oven	G. I. Fdy.
42	Make valve boss core—front and rear	Bench	G. I. Fdy.
43	Bake	Oven	G. I. Fdy.
44	Make valve boss core—center	Bench	G. I. Fdy.
45	Bake	Oven	G. I. Fdy.
46	Make gear case core	Core Machine	G. I. Fdy.
47	Bake	Oven	G. I. Fdy.
48	Paste oil chamber cores to gear case core	Bench	G. I. Fdy.
49	Bake	Oven	G. I. Fdy.
50	Blacken	Bench	G. I. Fdy.
51	Make body crank case core—front	Core Machine	G. I. Fdy.
52	Bake	Oven	G. I. Fdy.
53	Paste ten oil chamber cores to body crank case core	Bench	G. I. Fdy.
54	Bake	Oven	G. I. Fdy.
55	Blacken	Bench	G. I. Fdy.
56	Make body crank case core—rear	Core Machine	G. I. Fdy.
57	Bake	Oven	G. I. Fdy.
58	Paste ten oil chamber cores in body crank case core	Bench	G. I. Fdy.
59	Bake	Oven	G. I. Fdy.
60	Blacken	Bench	G. I. Fdy.
61	Make four barrel cores	Bench	G. I. Fdy.
62	Bake four barrel cores	Oven	G. I. Fdy.
63	Blacken four barrel cores	Bench	G. I. Fdy.
64	Make exhaust elbow core	Bench	G. I. Fdy.
65	Bake	Oven	G. I. Fdy.
66	Blacken	Bench	G. I. Fdy.
67	Mold	Molding Mach.	G. I. Fdy.
68	Finish mold	Floor	G. I. Fdy.
69	Set cores	Floor	G. I. Fdy.
70	Sand blast	Sand blast mach.	G. I. Fdy.
71	Chip	Bench	G. I. Fdy.
72	Grind	Portable grinder	G. I. Fdy.
73	Water test	Test stand	G. I. Fdy.

Machine Shop Operations

74	Chip three lugs of first operation	Bench	Mch. Shp.
75	Mill bottom	Milling mach.	Mch. Shp.
76	Mill top	Milling mach.	Mch. Shp.
77	Mill hand hole cover faces	Milling mach.	Mch. Shp.
78	Drill all stud and cap screw holes—14 holes in top—20 holes in bottom—11 holes in case end—9 holes in bell end	4 way drill press	Mch. Shp.
79	Rough bore four 3.845-inch holes	Boring mach.	Mch. Shp.
80	Water test	Test stand	Mch. Shp.
81	Rough bore 8 valve holes—4 exhaust holes—air pump hole—cam shaft thrust plug hole—water inlet hole and 8 valve lifter holes	3 way drill press	Mch. Shp.
82	Ream 8 valve lifter holes—drill 8 valve holes—counterbore 4 exhaust holes and 1 water inlet hole—chip valve seat burr	3 way drill press	Mch. Shp.
83	Ream 8 valve stem holes and seats	Drill press	Mch. Shp.
84	Drill 12 hand hole cover holes—drill 16 ⅜-in. tap holes in bearing, drill 9 holes in exhaust side	2 way drill press	Mch. Shp.
85	Finish bore four 3.675-inch holes	Boring mach.	Mch. Shp.
86	Mill gear case end	Milling mach.	Mch. Shp.
87	Mill back of water pump boss	Milling mach.	Mch. Shp.
88	Tap all holes in bottom and both ends	Tapping mach.	Mch. Shp.
89	Mill air pump boss	Milling mach.	Mch. Shp.
90	Drill five holes in intake side	Drill press	Mch. Shp.
91	Tap two 5-16-inch holes in intake side	Bench	Mch. Shp.

chased for stamping rear axle housings and frames is shown in Fig. 1. This gives a clear idea of the character of the equipment employed. This press, which was furnished by the Toledo Machine & Tool Co., Toledo, O., weighs 100,000 pounds. The bed has an area of 48 x 60 inches, with an opening 30 x 54 inches, the stroke being 10 inches and the gear ratio 40:1. This one machine cost over $6,000. In the new body and fender department a number of presses of similar character are now being installed. In the assembling department a great many special cast iron stands and racks similar to those shown in Figs. 3, 7 and 11 were constructed. These fixtures alone cost as much as the entire investment in many small plants. As indicated in Fig. 2, tables fitted with castors are

FIG. 11—SPECIAL FIXTURE FOR ASSEMBLING FRONT AXLES

utilized for motor assembly. The fixtures for assembling front axles, rear axles and transmissions, shown respectively in Figs. 11, 7 and 3, were specially designed for their purpose in order to obtain maximum output at minimum expense. Some further details regarding the machine tool equipment which was purchased will be given later.

The new press shop, Fig. 12, which, as mentioned previously, is 75 feet wide, 600 feet long and four stories in height, was built in 60 working days. This gives an idea of the celerity with which the Dodge plant was equipped for its new task.

In addition to the new shop buildings, it has been necessary to greatly enlarge the general office building. The latter is being extended 51 feet

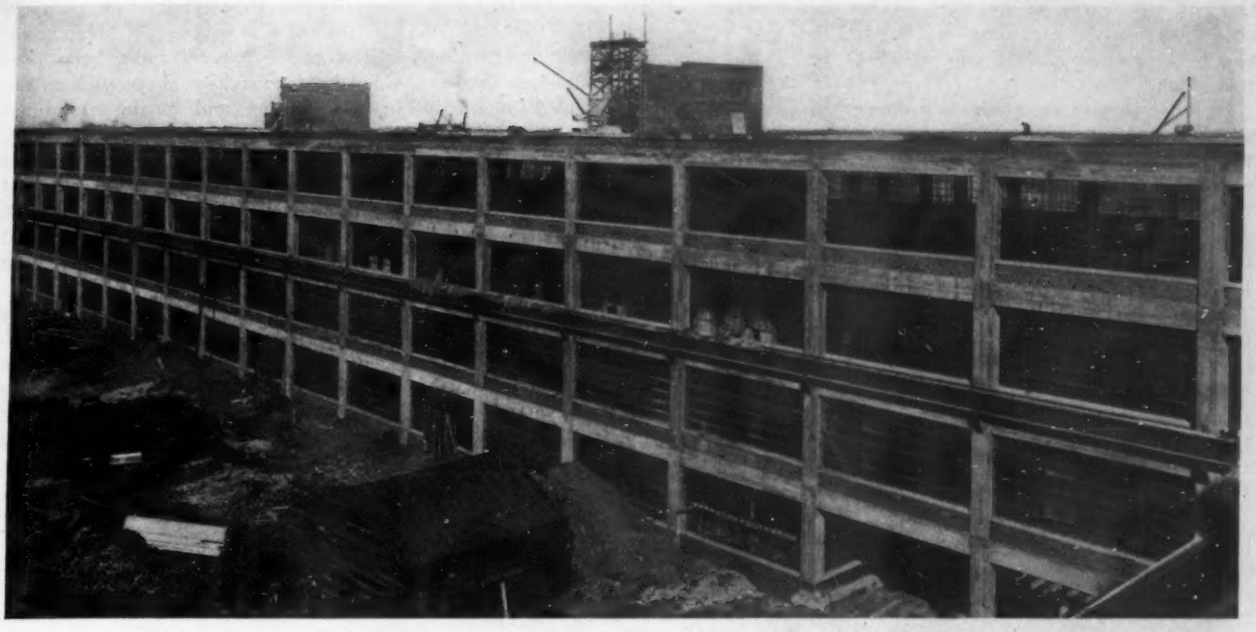


FIG. 12—NEW BUILDING FOR BODY AND FENDER DEPARTMENT ERECTED IN 60 DAYS

on either end, both wings being four stories in height. Although most of the new shop buildings are also four stories in height, the foundations are designed for six-story structures so that additional shop room may be provided when necessary in the future with a minimum expenditure of money, time and effort. As an example of the many relatively minor details that had to be attended to, the track for testing new cars is worthy of mention. It is located near the Dodge plant and every new car is given a thorough trial before it is shipped. In preparing for the manufacture of this car, Dodge Brothers found it necessary to scrap all of the old jigs and fixtures and build new from the ground up. The foundries, drop forging and heat-treating departments and the machine shops were completely re-equipped. This involved new patterns, molding machine rigging, core boxes, core driers, etc., in the foundry, innumerable new dies in the drop forge shop and a complete renewal of the jig and tool fixtures in the machine shops. It is difficult to express in words the amount of work and expense incurred. Providing the new tools, jigs and fixtures for the machine shops alone constituted a problem in production of sufficient magnitude to occupy the energies of an ordinary manufacturing establishment for a year. After the drawings for each part were made and their dimensions ascertained it was necessary to get up an interminable number of operation sheets. Then it was the duty of the tool designing department to plan and the tool-making department to produce the almost never-ending array of jigs and special tooling fixtures necessary for the rapid, accurate and economical produc-

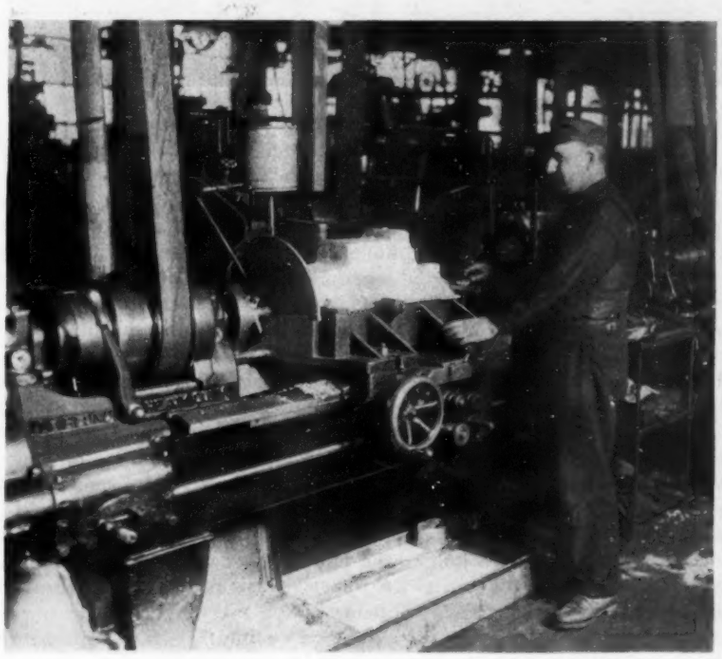


FIG. 13—ONE OF THE MANY SPECIAL LATHE FIXTURES

FIG. 14—MACHINE FOR SEATING VALVES

tion of the parts in question. The accompanying illustrations of tools and fixtures show a small part of what was done.

In order to give the reader a glimpse at this end of the proposition, the work involved in getting ready to manufacture the cylinder for the Dodge motor will be covered in some detail. The cylinder casting alone will be considered without the cylinder head, crank case or any of the fittings. The operation sheet covering this piece lists 91 items of which 73 are foundry operations and 18 are machine shop operations. This operation sheet is reproduced in its entirety in the table on page 914. For each of the cores mentioned special core boxes, jigs and driers were provided, while for the molds themselves new flasks, patterns and machine rigging were required. Although the foundry equipment required for cylinder production is extensive, it is eclipsed by the facilities provided in the machine shop.

For machining the Dodge cylinder castings, operations No. 74 to 91 inclusive, an investment of over $59,000 in new tools, jigs and fixtures was made. This included such apparatus as the Ingersoll four-spindle milling machine shown in Fig. 6, which mills up the plane surfaces on 18 cylinders and cylinder heads in one operation. Fig. 10 shows another tool included in the $60,000 cylinder-making outfit; it is a four-way Foote-Burt drill press which at one setting drills all of the stud and cap screw holes in the cylinder casting. There are 14 holes in the top, 20 holes in the bottom, 11 holes in the case end and nine in the bell end. A somewhat smaller three-way drill press is used for rough boring the eight valve holes, the four exhaust holes, the air pump holes, the cam shaft thrust plug hole, water inlet hole and the eight valve lifter holes.

A similar tool is used for reaming the foregoing holes, after which the eight valve stem holes are reamed and the valve seat ground on the eight spindle press shown in Fig. 14.

To recapitulate, the new milling machines and fixtures which were purchased or built for handling the cylinder castings cost over $15,000; the tools and fixtures for drilling and reaming operations cost an additional $29,800; suitable appliances for line boring the crank shaft holes were obtained only at an expense of over $5,800 and as mentioned previously, the total expenditure for properly machining this one piece were over $59,000.

Multiply this figure by a liberal factor to cover the numerous other parts in the Dodge car and you will have an idea of the financial outlay incurred. In no direction has legitimate expense been spared. The object simply has been to provide adequate equipment to manufacture every part accurately, satisfactorily and economically. Wherever more than two holes are to be drilled in one piece, special drilling heads are being built. Fig. 8 shows only a few of the many of these multiple spindle drilling heads which have been designed and built specially for the manufacture of parts for the new Dodge car. Numerous other special fixtures have been provided in the machine shop, such as the jig for turning and boring aluminum oil pans on heavy duty engine lathes, as shown in Fig. 13. The pressed steel rear axle housings are tooled out on a large Gisholt semi-automatic turret lathe, Fig. 4, for which a special chuck and tool equipment has been provided.

Although Dodge Brothers employ 180 men in their tool-making department and almost an equal number in the die-making department, when the work of reorganizing the shop was at its height, four other tool-making establishments in Detroit were requisitioned to get out new jigs and fixtures for the Dodge plant. Furthermore the details were followed up carefully. Take for instance the fixture for line boring the cylinder castings. This was made and roughed out in the Dodge shop, after which it was shipped to a prominent Cincinnati lathe builder for finishing. In order to be certain that there would be no hitches at the Cincinnati end of the proposition, the rough casting was personally conducted to the Queen City by the production manager of the Dodge works. It left Detroit in the evening, arrived in Cincinnati in the morning and by noon that day the work of finishing it had been commenced.

The re-equipment of the drop-forging department was no less elaborate

(*Continued on page* 946b.)

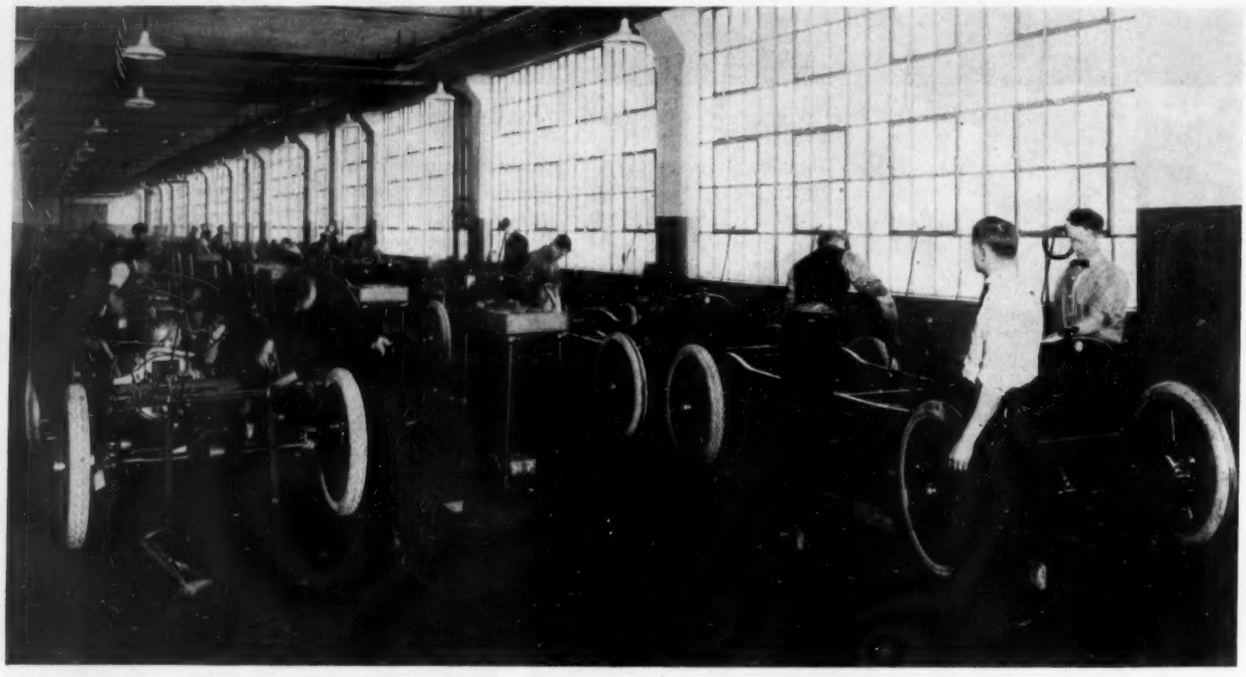


FIG. 15—FOR ASSEMBLING THE CHASSES MUCH SPECIAL APPARATUS IS NECESSARY

Grinding, a Manufacturing Process

A Plea for the Substitution of Grinders for Lathes on Certain Classes of Work

BY H. W. DUNBAR

IT IS not the intention of the grinding machine manufacturer of today to deprecate the value of the lathe, milling machine, planer or any of the other more commonly known forms of machine tools, but rather, owing to the presence of the modern grinding machine, the value of these other machine tools is enhanced.

Let us suggest a radical departure from the now common form of organization in most all machine shops. It is our firm belief that the turning department and the grinding department should come under the same foremanship, as the finished part requiring grinding is only produced at least cost when the proper relationship of the turning operation to the grinding operation has been determined. So, by placing the responsibility of the final cost with one man we are working toward the end which must result in the most economical production of round work.

The proper relation of turning to grinding can only be determined by a scientific investigation of each piece to be finished. Sometimes it is most profitable to grind without turning at all; more times, it is not.

Countershaft Work

In the case of long frail work like countershafts, it is customary first to turn and then grind to size. It is true that in producing such a piece, 1/16-inch in diameter can be removed in less time in the lathe than in the grinding machine, but it is not true in all cases that it will cost less, for the reason that when such pieces are turned rapidly with a single cut in the lathe, although only 1/16-inch is removed, they must be straightened before they can be ground. We have in mind a piece of work that required six minutes for turning the roughing cut and nine minutes for rough grinding, but the straightening after turning required nine minutes. So, in this case, the turning was literally thrown away. These pieces were afterward rough ground, taking off 1/16-inch in nine minutes and the work required no straightening.

Please do not assume that the grinding companies recommend grinding without turning in all cases; they do not. The reverse is usually true, but it is also true that thousands of dollars are thrown away in this country every year because shops follow tradition and turn everything before grinding and thousands more are lost because shops following tradition turn work too nicely and too expensively and too close to size.

In most manufacturing processes, at some time or other, comes the question of the automatic machine. This has also been true in the grinding machine field, and we have developed an automatic machine. The introduction of the full automatic, we are sorry to say, is not very successful in most establishments. Mechanical ability these days is so limited that proper attention and care is not given to the machine, which, because of its nature, requires attention.

It is within a comparatively few years that the users of grinding machines and even some of the manufacturers of grinding machines, have accepted the theory of the use of the wide face grinding wheel as advocated and advanced by Charles H. Norton. Tradition has said that it was impossible to get accurate work properly finished and in good time by using a wide face wheel. Up to a short time ago, a wheel 1½ inches wide was considered as a wide wheel. Today we have machines which carry wheels up to 12-inch face, which not only make possible the grinding of formed parts but also increase the production and broaden the field of cylindrical or straight grinding.

Millions of Cutting Points

Today we have multiplied the cutting points so that on the average wheel 4 inches wide and 24 inches in diameter, 1,086,171,000 cutting points come in contact with the work each minute. Increase this by using a wider wheel, and it, of course, becomes obvious that with a greater number of cutting particles coming in contact with the work in a given time, a greater amount of material can be removed.

This brings us to the possibility in using a wide face wheel with a specially trued form for the purpose of grinding irregular shapes. It is essential in form grinding that the form be continuous and uniform, that there be no under-cuts to grind, as virtually the same laws govern in so far as the shape of the grinding wheel is concerned, as govern form milling; the grinding wheel is only a milling cutter having infinitely more teeth.

Limitations of Form Grinding

The limitations of form grinding are governed entirely by the capacity of the attachment used in shaping the wheel, and the control of the peripheral speeds of the wheel at the various points in the form, so that with the proper wheel this variation comes within the possibilities of the "grain and grade" furnished. Deep forms are possible but not practical, as the difference in the diameter on the various points in the form produce a different cutting action on the wheel, and naturally a wheel that is satisfactory on deep cuts is not satisfactory on shallow ones. Of course, it is understood in grinding a form that the wheel cannot be traversed but must be fed straight into the work. Simpler forms, such as putting the fillet in the shoulder of a shaft or the neck of a roll, are accomplished with one corner of the wheel and the straight part of the cylinder ground with the face of the wheel. As a matter of fact, straight grinding, where the work is not traversed, could be termed form grinding.

No doubt the question will be asked, "Do you not have to true the wheel often, and isn't it expensive?" We must say that the wheel must be trued and must be trued often to keep the face as near perfect as possible. Taking the original standard of width, which was ½-inch, and assuming a wide wheel of 12 inches, we have 24 narrow wheels working at once on the cylinder. Now we have but to consume the same amount of time and expense in truing this wheel of 12-inch face as we would require to true 24 wheels of ½-inch face, and in return for our labor of truing, we have ground the piece of work in practically one-twenty-fourth of the time. The fear of most people that the truing of the wheel makes grinding expensive is a natural one, but

Portions of a paper read at the April meeting of the New Haven section of the American Society of Mechanical Engineers. The author, H. W. Dunbar, is associated with the Norton Grinding Co., Worcester, Mass.

should be set aside. Work with close limits and severe requirements can only be accomplished in most cases by the grinding process. True cylinders, absolutely round within 0.0001-inch, can be produced practically by no other means than the grinding machine. Hardened steel parts which must be shaped can only be handled by grinding. It is a question of dollars and cents. A generous use of the truing diamond increases production, insures the accuracy of the product and gives satisfactory results; also different degrees of finish can be secured by truing the wheel so that the face will be smooth or sharp.

Crowning Pulleys by Grinding

It may be interesting to know that by crowning pulley faces by the grinding process with the formed wheel, it is possible to produce a uniform curve throughout the width of the face. The old method of crowning pulleys by two tapers was always inefficient, whereas the curved face having a uniform crown and with as little height as possible, has been considered preferable as making the belt adhere more uniformly to the face of the pulley, increasing the driving qualities of the belt. By the grinding process the rim diameters of the pulley can be held accurately to size within 0.001-inch, making it possible to reduce the height of the crown without interfering with its function of guiding the belt.

The faces of sheet mill rolls must be produced with the diameter at the center larger than at the edges and the face must be ground to a uniform curve throughout. This is accomplished in the same manner as pulleys are crowned, and has brought about very satisfactory results in the mills, increasing the life of the roll because of the possibility of removing less material by the grinding process.

This is a day of specialists, and we now have special purpose machines arranged for specific operations, carrying wheels 6 inches, 6½ inches, 7½ inches and sometimes 8 inches wide. On these machines, the table is not traveled, but the wheel is fed straight into the work, and the cut taken all in one operation. We have an example in automobile factories where axles are made. A 6⅜-inch face wheel makes 60 cuts per hour, removing 0.015-inch stock, and holds to a limit of 0.0005-inch. Shrapnel shells are being produced complete in three cuts, including the curved nose, in six and seven minutes each, including handling and removing from 0.040-inch to 0.060-inch of stock. Rifle barrels are being formed on the taper and shaped at the curved end, five operations in all, using 7½-inch face wheel, a 3½-inch face wheel and 2-inch face wheel, producing barrels in a remarkably short time with a finish and degree of accuracy very satisfactory to the manufacturers.

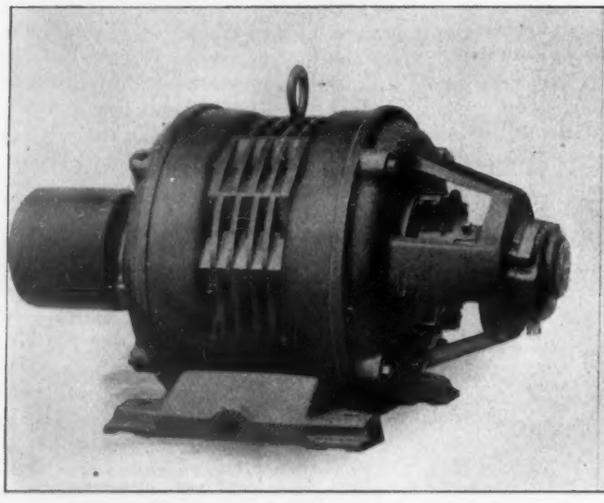


FIG. 1—MOTOR FOR SMALL MACHINE

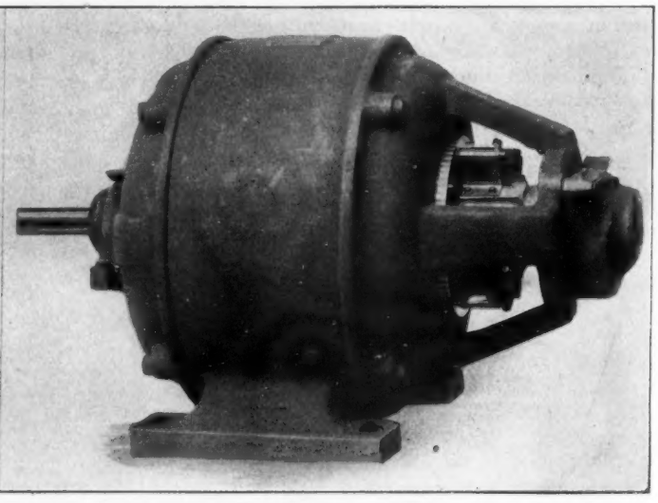


FIG. 2—MOTOR FOR LARGE MACHINE

Motors for Driving Small Machines

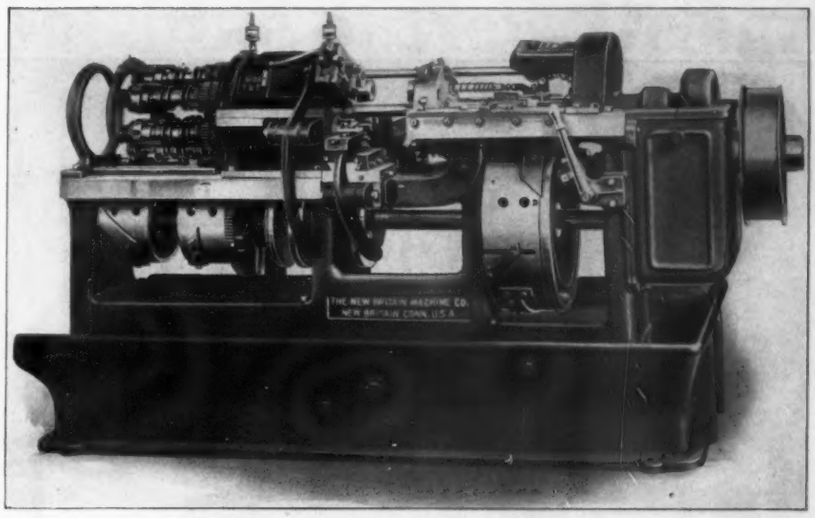
A line of single-phase motors designed especially for operating small machines, has been developed recently by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. They range in size from ½ to 10 horsepower and are wired for 60-cycle circuits.

The motors are said to be both light and substantial. The larger sizes are of the design shown in Fig. 2, and are of steel frameless construction. The smaller sizes which have cast iron frames are shown in Fig. 1. It is said that these motors can be easily adapted for wall or ceiling mounting and quickly adjusted for clock-wise or counter clock-wise direction of rotation. They can be connected externally for operation on either 110 or 220-volt circuits.

Stainless Steel

The Firth-Sterling Steel Co., McKeesport, Pa., has concluded an arrangement with Thos. Firth & Sons, Ltd., Sheffield, Eng., for the manufacture of Firth stainless steel for the American market. This metal was developed in the Sheffield district and is used primarily for the manufacture of cutlery. Its qualities, however, are such that undoubtedly it will find a much larger application, for the parts of automobiles, sewing machines, typewriters, canning machinery, guns, machine tools, etc. When made up in the form of cutlery, it is said that this steel does not rust or stain, even when employed for cutting acid fruit. In any of the various forms in which it may be manufactured it is said to resist corrosion satisfactorily and to remain bright without polishing. As distinguished from other rust resisting alloys which have appeared on the market from time to time, the new metal is a true steel. It can be tempered, worked, forged and hammered, at proper temperatures, like tool steel. In the tempered condition it is said to have a maximum tensile strength of 110,000 pounds per square inch, accompanied by an elongation of 20 per cent and a reduction of area of 60 per cent. In the hardened condition, the tensile strength is raised to nearly 200,000 pounds per square inch. The steel will not weld, but this does not interfere with its usefulness in many directions. It is not abnormally expensive.

New Screw Machine



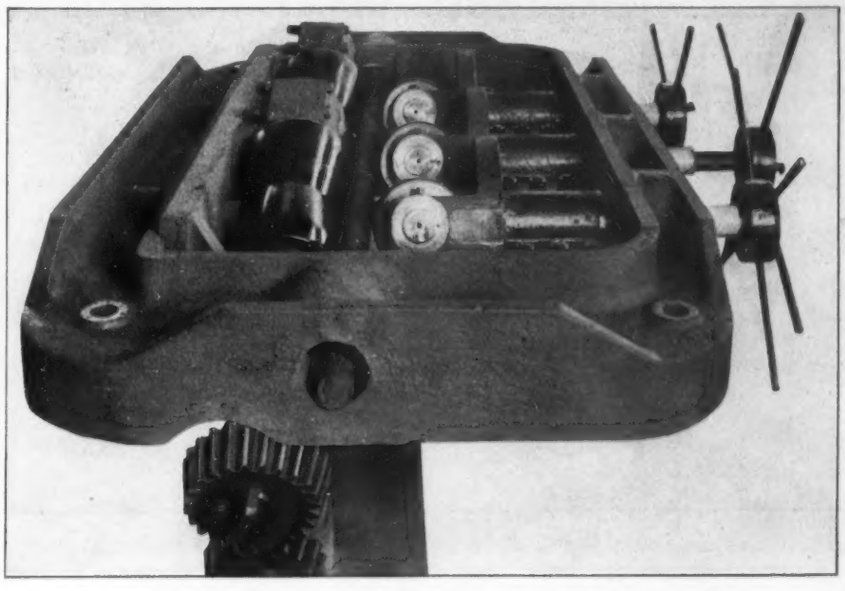
NEW SIX SPINDLE AUTOMATIC SCREW MACHINE

In the accompanying illustration is shown a six-spindle automatic screw machine developed recently by the New Britain Machine Co., New Britain, Conn. It is thought to be the heaviest multiple spindle screw machine on the market, being especially designed for heavy service. Its rigidity of construction is said to permit heavier cuts and coarser feeds than usual. The base forming the chip pan and oil reservoir extends to the floor, making a broad foundation which tends to prevent vibration. The spindles are of large diameter and the spindle bearings are bronze. Provision has been made for taking up wear in the bearings without disturbing their alignment. Ball thrust collars are provided to receive the end thrust due to tool pressure.

Through change gears, six rates of spindle speeds can be secured. A separate system of change gears is provided for effecting changes in feed by varying the speed of the cam shaft. The spindle cylinder is heavy in design and is always indexed at constant speed. The threading spindle is driven independent of the others and through change gears its speed can be varied. The threading mechanism operates independently of the tool slide. The die is run on and off while the box tools are in operation. Left-hand threads are cut by inserting an extra gear in the train driving the threading spindle. This reverses the motion of the spindle in threading. The indexing mechanism accelerates and checks the motion of the heavy cylinder gradually. The tool slide is of rigid construction. The ways are large and of such length that there is no overhanging. The tool slide cam is laminated similar to a leaf spring. This construction is said to permit the adjusting of one cam to all lengths of work within the capacity of the machine. The cam shaft is driven through a large internal gear on the inner circumference of the feed cam drum. The power feed is actuated through convenient hand control levers. A hand feed crank is provided for testing all feed movements and tool positions. The machine is designed for either belt or motor drive.

One Pass Straightening Machine

THE Abramsen Engineering Co., Union National Bank building, Pittsburgh, recently developed a machine for straightening rods, bars and pipe. It is shown in the accompanying illustration. Machines of this type have been installed in a number of plants in this country and Canada. They are said to straighten round bars automatically in one pass. They are built in sizes to handle material from ⅜-inch to 6 inches in diameter. Adjustments from one size to another are made by hand-wheel operation, with minimum loss of time. The Abramsen machine contains two sets of cross rolls arranged in tandem, with an intermediate pressure roll. The material to be straightened is held firmly at two points while the pressure is applied at the intermediate point. Through the reaction of this pressure one end of the bar or pipe is straightened between the second set of cross rolls acting in conjunction with the intermediate pressure roll, and the other end of the material is straightened in the first set of cross rolls in a similar manner. It is said the material is given a smooth, polished surface in the straightening process. The Abramsen straightening machine is designed to operate at the rate of 25 feet per minute.



MACHINE FOR STRAIGHTENING RODS, BARS AND PIPE

When drilling or turning hard steel (not hardened steel) in the lathe, run slowly and lubricate the tool with turpentine, or turpentine and spirits of camphor.

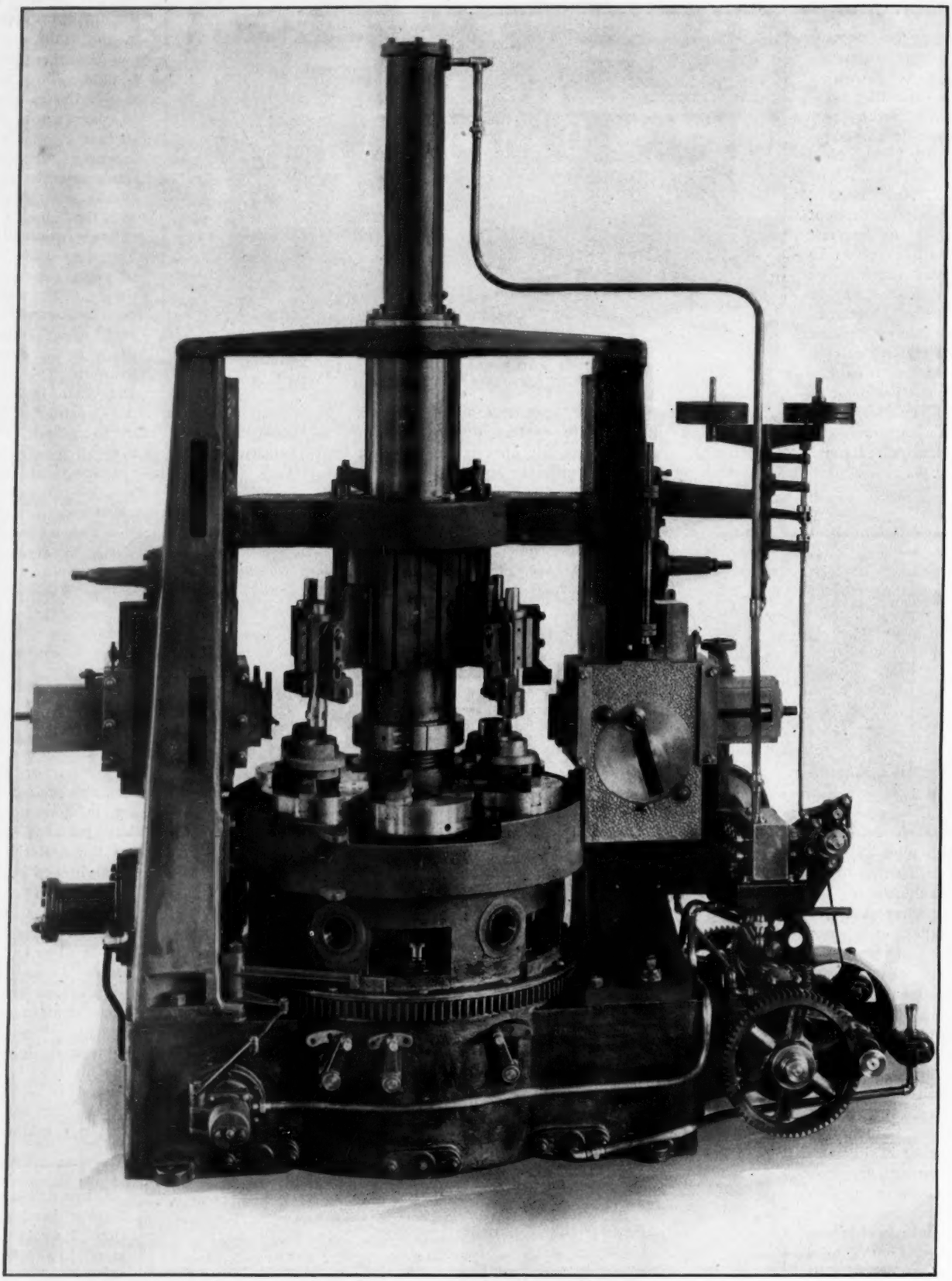


FIG. 1—HYDRAULICALLY OPERATED, SIX-SPINDLE, AUTOMATIC CHUCKING, BORING AND TURNING MACHINE

Machine of New Design

Description of the Conradson Hydraulically Operated, Six-Spindle, Vertical, Automatic Chucking, Boring and Turning Machine

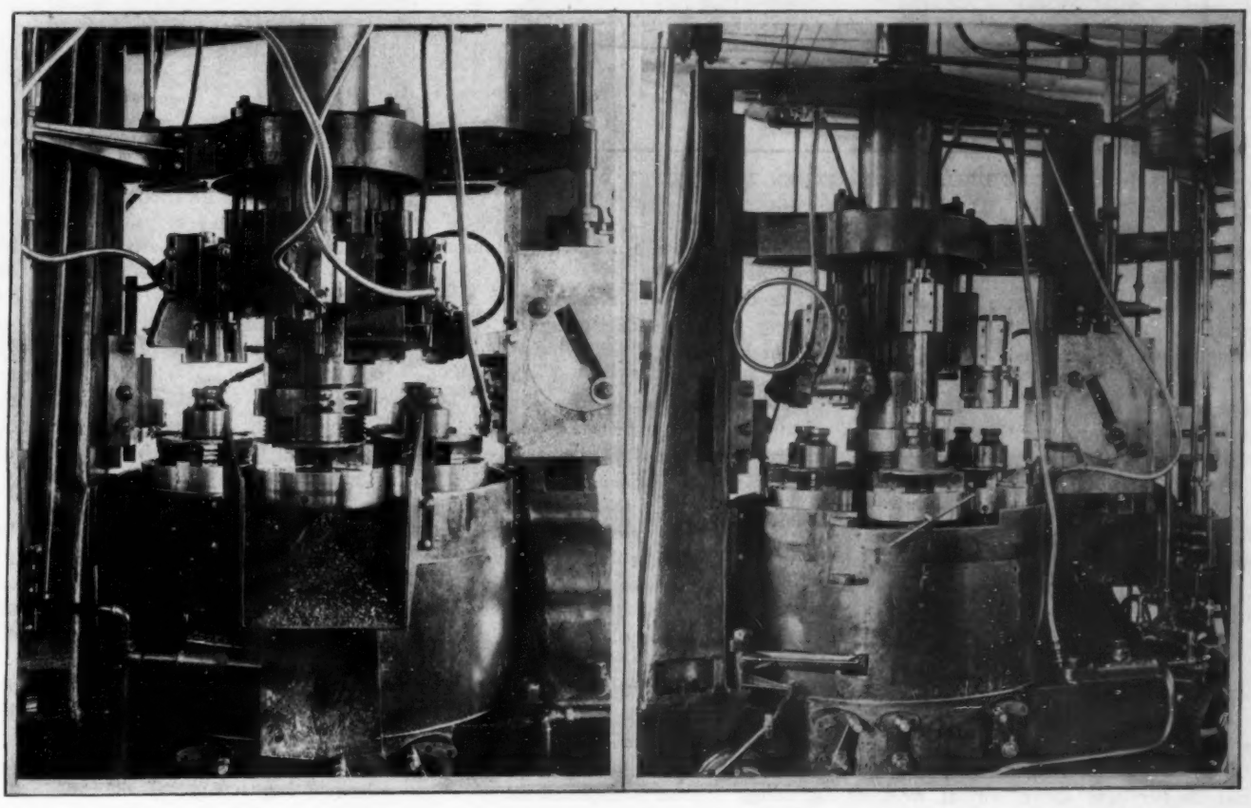
A MACHINE based on principles new to tool building is shown in the accompanying illustrations. It is known as a hydraulically operated six-spindle, vertical, automatic chucking, boring and turning machine. The tool was designed a number of years ago by Conrad M. Conradson, who aimed to develop a machine which could be easily set up, controlled, and fed and would combine rigidity with accuracy.

The machine has passed the experimental stage and is being marketed by the Giddings & Lewis Mfg. Co., Fond du Lac, Wis. Among the installations made, are those at the plants of the Packard Motor Car Co., Detroit; the Buick Motor Co., Flint, Mich., and the Ferro Machine & Foundry Co., Cleveland. Two machines have been installed at the Ferro plant, the smaller having been in operation for several months.

FIG. 2—VIEW SHOWING REGULARITY OF FEED

In turning out fly wheels at the Ferro plant, this machine is said to be 3½ times as rapid as the tool formerly used for this work. In the first operation in machining fly wheels a ⅜-inch cut is taken off the 4-inch face of the wheel in 2 minutes and 45 seconds. The machine carries tools for cutting both vertically and horizontally. Due to the use of the differential hydraulic cylinder system, the feed remains steady and the tool is prevented from digging into soft spots or dropping into blow-holes. Among the advantages claimed for the machine is the fact that there are no cams to be set and no parts to be removed. It is said that the machine can be set manually for any job within its range and that both the spindle speeds and feed may be changed at any part of a cut.

The machine is being built in two sizes; the smaller is designed to handle



FIGS. 3 AND 4—CLOSE VIEWS OF MACHINE READY FOR OPERATION

work up to 12 inches in diameter and 12 inches long and the larger takes parts 27 inches diameter and 18 inches long. The chucks, as shown in Fig. 1, are rotated by a train of gears from the main drive pulley. Hydraulic pressure is supplied by a multi-cylinder pump through the controlling or timing box, from which pipes lead to the various operating cylinders.

The sliding carrier block, to which the tool heads are bolted, is hydraulically operated and is attached to a cross bar. There are adjustable gibs at each end of the cross bar which slide in guides. The two cross slides, shown at the sides, have individual adjustments and are carried in saddles gibbed to the columns. These saddles can be adjusted up or down by means of a handle. A vertical slide carries the slotted disc shown in the illustration. The stroke of the cross slide is varied by setting the slot in the disc at various angles with reference to the travel of the vertical slide. The stroke of the vertical slide is governed by locknuts. A stop lever is provided for bringing the index holes in the chuck carrier in exact line with the locking plunger.

The speeds of the various chuck spindles are varied by change gears. There are two change gears for each spindle. When the tool carrier is forced down against the stop collar, the feeding action is stopped and the tools are allowed to smooth up the surfaces while the work is making a number of idle revolutions before the trip accumulator releases the timer. The accumulator mechanism is shown at the extreme right of the machine. It is loaded with weights which cause the pressure of the liquid in the main cylinder to rise 25 per cent above normal working pressure before the trip acts.

The chuck carrier is indexed by a rack connected to a hydraulic piston. This rack meshes with a ratcheted pinion on a shaft which carries another pinion meshing with a large rack gear on the lower part of the carrier. The vertical tool carrier consists of a hexagon block fitted with gibs.

No outside pumping system is needed to supply the necessary pressure for operating the machine. A set of cam-operated valves located in the timing box are used for timing the various movements.

Portable Drill and Grinder

A portable drill and grinder designed for heavy work is shown in the accompanying illustrations. It is claimed for this tool that it can be used not only as a drill press and as a stationary grinder but for purposes where such tools cannot be used. In Fig. 2 the outfit is being used to remove scale from ammonia condensing pipes.

The complete outfit consists of a revolving tool bit socket mounted on the end of a flexible shaft, which is driven by a Westinghouse motor through a variable speed friction disc device. The motor and friction drive are mounted on an iron base fitted with swivel casters, and the unit is enclosed in a metal case fitted with handles to facilitate carrying.

Adjustment is provided to take up wear on the driving disc and to vary the contact between the discs for various classes of service. By means of a lever, six speeds can be obtained at the tool. The tool can be stopped without shutting off the current from the motor. By the use of attachments it is said that 18 speeds ranging from 165 to 3,200 revolutions per minute can be secured for grinding, drilling and polishing.

The tool is built in sizes from ¼ to one horsepower. The largest size will accommodate drills up to 1½-inch diameter. The flexible shafts range in length from 5 to 10 feet. The tool has been developed by the United Mfg. Co., Kansas City, Mo.

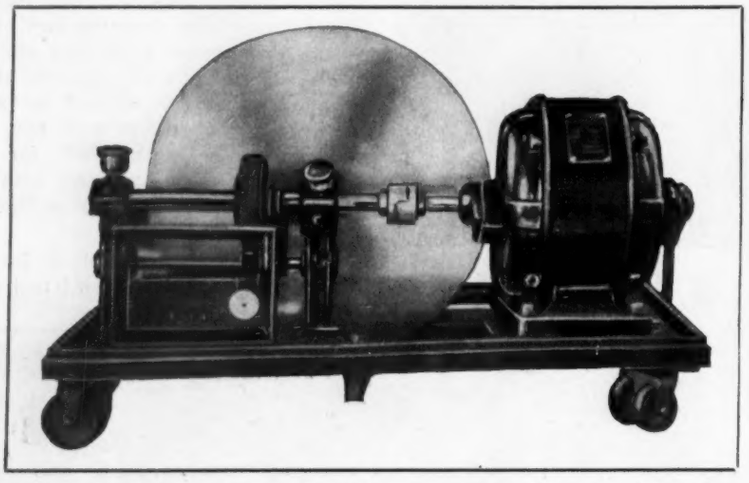


FIG. 1—PORTABLE DRILL AND GRINDER WITH COVER REMOVED

FIG. 2—REMOVING SCALE FROM AMMONIA CONDENSING PIPES

Wood Block Floors

The development of creosoted wood blocks for the floors of industrial plants, in which the Ayer & Lord Tie Co., Chicago, has been prominent, has brought out a number of interesting facts regarding the application of this material. It has been found, for instance, that a block treated for street service is not applicable for floor service, owing to shrinkage and seeping. Also the atmospheric conditions influencing the floor are radically different in buildings from those met in out-door service. Consequently a standardized wood block has been specially developed for factory floors. It is thoroughly seasoned before treatment to do away with shrinkage and is impregnated with a pure creosote oil to avoid leaking or seeping. It is said that the sand cushion ordinarily used in street service is unsatisfactory for floors in industrial plants. A pitch or asphalt cushion is used instead, resulting in a dry, uniform surface which is thoroughly solid and firm.

Drills should be kept in bins to protect the cutting edges, and kept sharp for instant use. It is a good plan to have a hardened steel gage fastened to the bin so that the boy in the tool crib can be sure he is putting the drill in the right place. Thus, he can also be sure that he is giving out the size asked for.

In drilling hard materials use turpentine as a lubricant. This, however, is not always necessary.

History of the Milling Machine

Interesting Facts Regarding the Early Development of This Important Tool —Functions of the Modern Milling Machine

BY LUTHER D. BURLINGAME

THE EARLIEST milling cutter of which I have knowledge is one made by the celebrated French inventor, Jacques de Vaucauson, some time prior to 1782. This cutter, shown in Fig. 1, has teeth evidently chipped by hand and appearing much like those of a coarse file. It suggests the thought that early milling was nothing more than an attempt at substituting power for hand work in filing, using a rotary file in a machine for the purpose. In this respect it is entirely different from the modern conception of milling, where each tooth of the cutter becomes a substitute for a lathe or planer tool and is capable of removing a substantial chip.

It was the invention of the formed cutter which could be sharpened on its face without changing its form which not only revolutionized the making and use of cutters for producing irregular forms, but which also greatly increased the value of the milling machine. This, coupled with the invention of the universal milling machine, gave a new impetus to the art of milling and to the use of milling machines. The credit for both of these inventions is usually given to Joseph R. Brown.

It is hard for us to put ourselves in the place of the early mechanics,

FIG. 1—EARLIEST MILLING CUTTER, INVENTED BY VAUCAUSON

and to realize with what limited facilities they had to work. George E. Whitehead, who was an apprentice at the Brown & Sharpe works at a time soon after the universal milling machine was first brought out, says that he well remembers the introduction of the use of end mills. Previous to this all square and hexagonal head screws were made two at a time on centers, the heads being planed and then filed to fit gages.

The use of high speed steel for cutters has introduced many new conditions in the design of milling machines, the requirements now being for a much more rugged design of machine; also provision has been made for a greater amount of lubricant, the use of an air blast, higher speeds, etc. A manufacturing machine equipped for utilizing a large quantity of lubricant is shown in Fig. 8. The cutter which is supplied with 12 gallons of soda water per minute, removes 10 cubic inches of machinery steel of 65,000 pounds tensile strength per minute.

For cutting cast iron, an air blast attachment is of value. It makes it possible to not only cut at a high speed, but to prevent the cutter from becoming dull for a long period. With an air blast the cutting of 16-pitch cast iron gears can be successfully done with a feed of 21 inches per minute using high speed steel for the cutters, while only 5⅛-inch feed per minute could be obtained with the carbon cutter and without the air blast. If fed at the rate of 21 inches per minute with the high speed steel

Portions of a paper read at the April meeting of the New Haven section of the American Society of Mechanical Engineers. The author, Luther D. Burlingame is industrial superintendent, Brown & Sharpe Mfg. Co., Providence, R. I.

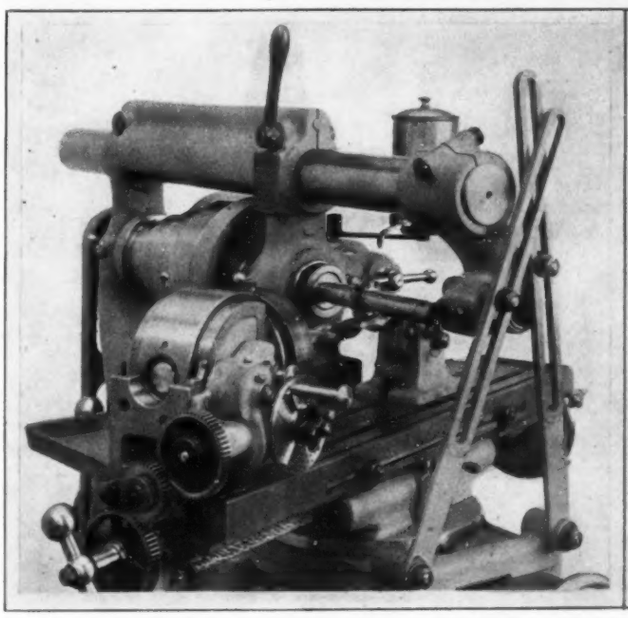


FIG. 2—GROOVING A TWIST DRILL ON A MODERN UNIVERSAL MILLING MACHINE

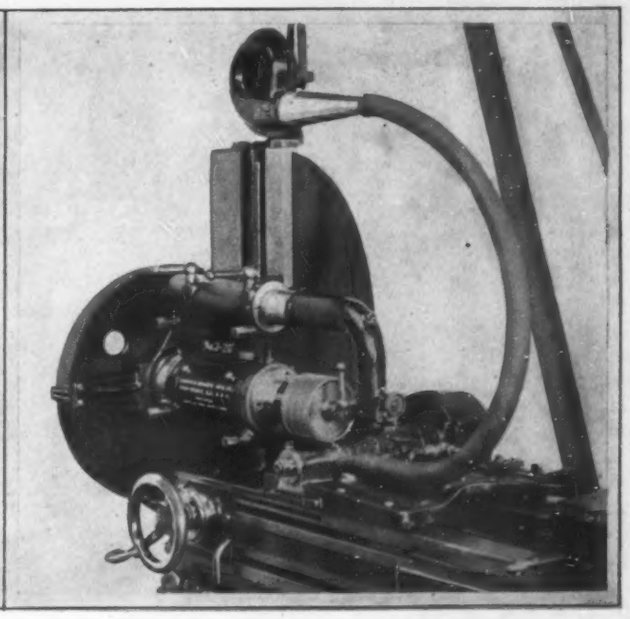


FIG. 3—GEAR CUTTING MACHINE PROVIDED WITH AIR BLAST FOR COOLING CUTTER

cutter and the air blast, over 12,000 teeth can be cut before resharpening. By slowing down to 18 inches feed per minute, other conditions remaining the same, more than double that number of teeth can be cut without

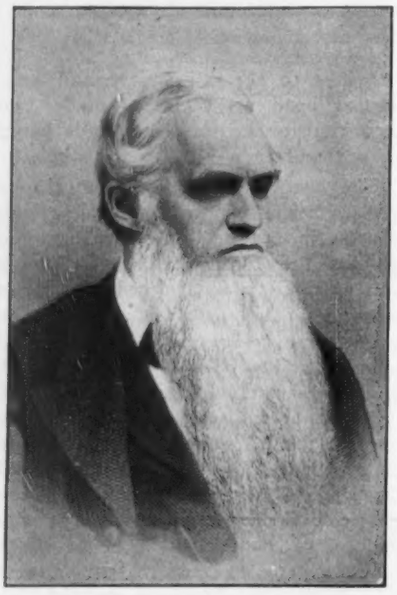


FIG. 4—JOS. R. BROWN, INVENTOR OF FORMED CUTTER AND OF UNIVERSAL MILLING MACHINE

resharpening. In Fig. 3 is shown a gear cutting machine fitted up for the use of the air blast. A system by which there is a suction of air is nearly as effective, and has the advantage of carrying the chips and dust away from the machine.

The first universal milling machine was designed and built at the works of the J. R. Brown & Sharpe Co., in 1861-62. At the outbreak of the civil war there were a number of machine shops in Providence, which took up the manufacture of war material. Among these was the Providence Tool Co., which established an armory and went into the manufacture of Springfield muskets for the government. One of the parts of this musket, the nipple, was drilled by means of twist drills, the grooves in these drills being made by hand filing. This was an expensive operation, and Frederick W. Howe, then superintendent of the Providence Tool Co., arranged with J. R. Brown & Sharpe to build a machine for cutting these grooves. The result was the universal milling machine. The use of a modern universal milling machine, for cutting grooves in twist drills, is shown in Fig. 2.

This first universal milling machine was re-discovered, many years after it was built, and after going through many vicissitudes, is now being carefully preserved for its historic interest. After being used by the Providence Tool Co. during the civil war, it passed into the possession of the Household Sewing Machine Co., and later into the hands of dealers. It was sold to parties in New York state and finally was returned to Providence, where it was used in the manufacture of jewelers' supplies by Samuel Moore & Co. It was here that the Brown & Sharpe Mfg. Co. searched it out, exchanging a new machine for it. It was still in good working condition when it came back into their hands about the time of the Columbian exposition in Chicago in 1893. It was there exhibited, being given the place of honor among universal milling machines of a new line then just brought out. Among

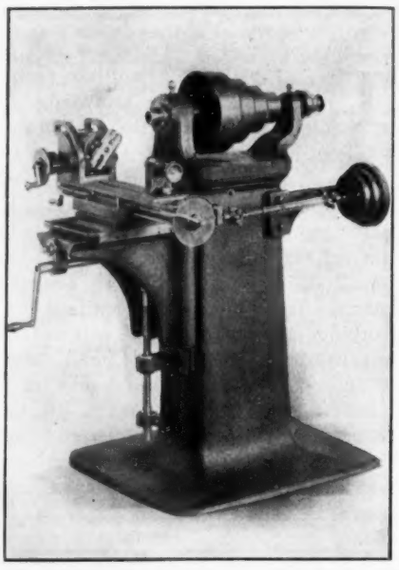


FIG. 5—FIRST UNIVERSAL MILLING MACHINE BUILT

the visitors to the exposition was the tool maker, Charles A. Eames, who first ran this original machine. He recognized it as an old friend, and taking hold of the operating handles, put it through its motions, while relating to those about him incidents connected with its early use.

In illustrating the modern development of the milling machine it may

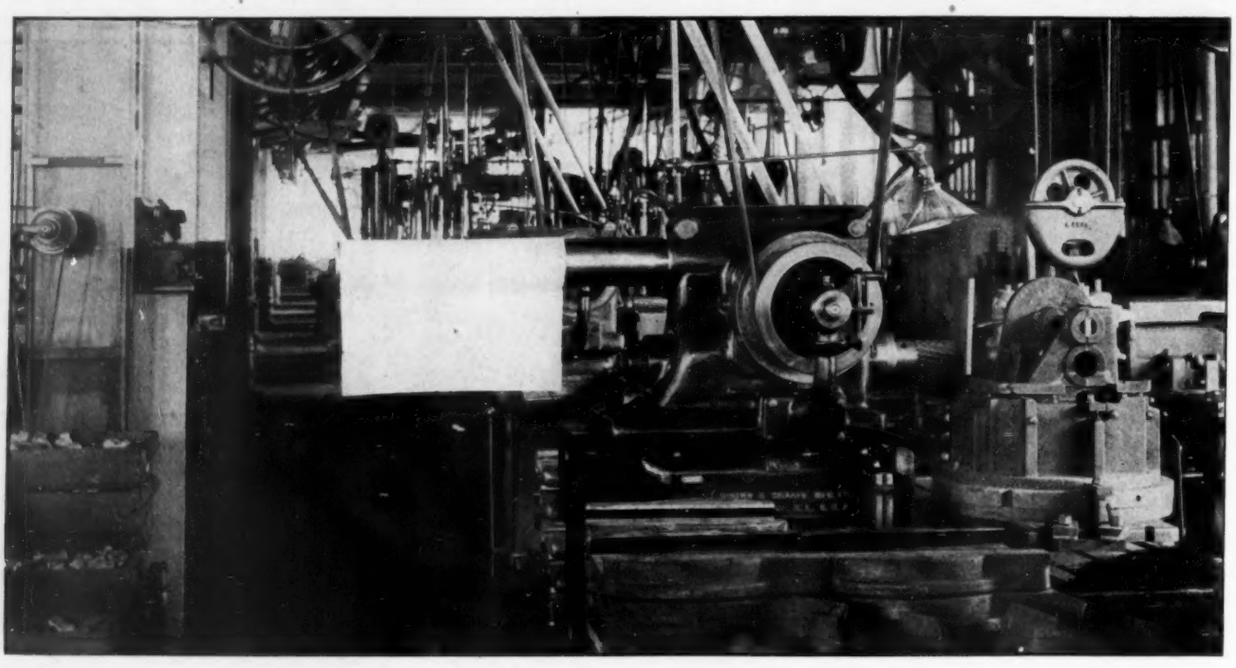


FIG. 6—METHOD OF AVOIDING ACCIDENTS DUE TO PARTS OF MILLING MACHINES PROJECTING INTO PASSAGEWAY—WHITE PAPER IS HUNG ON PROJECTING PART

be of interest to show how this machine now supplements the work of other well-known machine tools. The machine coming most directly into competition with the milling machine is the planer and it is often a question on which the work shall be done. In finishing milling machine tables, for instance, a complete table, top and bottom, can be machined in the milling machine at one traverse. An efficient means of using the milling machine for planing is by the method sometimes called "continuous milling". By this method the work, held in a circular fixture, is machined as it passes beneath the cutter and the finished work can be taken off and reciprocated by a crank motion from the spindle.

In the matter of cam cutting, the milling machine stands pre-eminent among general machine tools. Not only is the machine adapted to cam cutting in all ordinary lines, but for making cams for screw machines, where a great variety of leads must be quickly and cheaply produced; by elevating the spiral head to the required angle and using it in connection with the vertical spindle milling attachment any required lead can be obtained simply by varying the angle at which the spiral head is set. Tables have been prepared so that the workman is not required to make the calculations for setting the head. While, as has been pointed out, the original milling machine, as invented by Mr. Brown, contained the vital points of the machine of today, the present machines are quite different in appearance, and have developed many refinements, aside from those already described in connection with the spiral head. Among the most important of these are such as have been made to meet the requirements of heavy cutting, such as the addition of the overhanging arm, and braces, power feeds and the greatly added weight of the parts. As a result of these improvements, vibration has been largely eliminated, even under the heaviest cuts of which the machine is capable. To illustrate this, a plain milling machine of the constant speed type was put through a test cut and during the cut a nickel set on edge on the table was not tipped over. The added weight in the larger sizes of milling machines of the knee and column type has been carried to a point where the strength required for manual operation would be a serious handicap, except that power elevating and table feeding devices as well as the regular power feeds have been added to relieve the workman from undue fatigue.

Modern requirements call for added driving power due especially to the introduction of high speed steel, and it has been found that this can be obtained economically by the use of the constant speed drive type of machine, having a constant speed pulley with a wide face and large diameter running at high speed. From this pulley power is transmitted through one train of gearing to the spindle, and through another to the feed, each train being independent of the other, the changes being in geometric progression, and the construction being such that the adjustment of levers on the side of the machine will quickly give any required feed or speed.

In the cases where the cone is retained on the machine, a geared

FIG. 7—INSPECTING A MILLING MACHINE BEFORE PUTTING ON MARKET

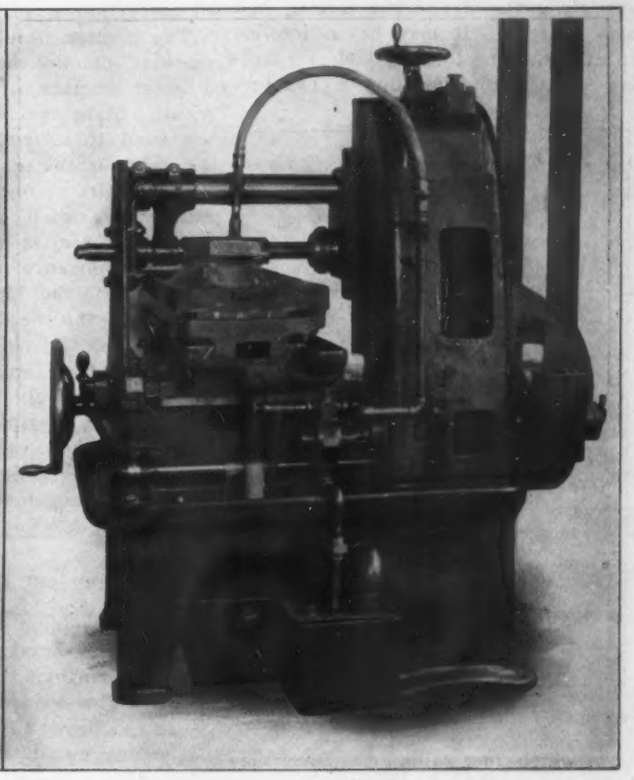


FIG. 8—MODERN MILLING MACHINE MAKING HEAVY CUT WITH AID OF LUBRICANT

new pieces replaced by the operator so that there is no stopping of the machine and no lost time. Vertical spindle milling machines are frequently used for machining the bottoms of flat irons by this method. The machine can even be used with a planing tool. In this case a special attachment is clamped to the face of the column so as to hold the spindle from revolving, the work being fed by the tool as in a planer or slotting machine. When used on a constant speed drive milling machine the automatic feed can be used when the spindle is so clamped. Slotting work also may be done, in certain cases, by using a slotting attachment in which the tool is

counter-shaft has been devised so that from an overhead belt running in one direction at a constant speed, changes in speed and direction are obtained in a geared box, but controlled by levers on the machine. This is in addition to the regular changes of speed by means of the steps of the cone.

Another feature which has been given attention in the design is the matter of safeguarding, to which little attention was given in the early days. In the old milling machines the gears were exposed; now, however, they are guarded, as shown in Fig. 9. Later designs had the gears inside, so that less guarding was needed, while the most up-to-date designs have the gears entirely enclosed and the driving belt also guarded. It may be of interest to call attention to a method of guarding parts projecting into a passage-

SPOT WELDER FOR HEAVY WORK

way, which, in a milling machine, may be either the overhanging arm or the work; in such cases danger can be avoided by hanging a white paper on the projecting part to attract attention, as shown in Fig. 6.

An element of danger in connection with the use of the milling machine, which it has been found especially hard to guard against, is the cutter itself, many accidents in the past having occurred from the workmen, especially boys, using their fingers to wipe away the chips from in front of the cutter. There should be a rule, thoroughly enforced, to the effect that the fingers must never be used to wipe away chips and a brush should be provided for this purpose. An interesting substitute for the brush is the use of a stream of soda water under considerable pressure which can be applied by pressing a button.

For plain bearings and their alignments the operation of hand scraping is still found to give the best results. I refer to scraping to surface plates, with careful tests for alignments, rather than simply scraping a finish for looks. After the alignments have been made by careful workmen every machine is inspected, Fig. 7, to see that it comes within the required limits of accuracy, a special truck being furnished the inspector with a complete set of tools needed to facilitate his work. An inspection sheet is provided to record this information. The limits for the alignment of the spindle are that it shall run true within 0.002-inch at a point 16 inches distant from the end of the spindle. The thoroughness of inspection is plainly indicated.

The modern development of milling machine practice has called into use a great number of standard attachments. Many special attachments also are used to advantage, such as that for grooving shafts. In milling grooves in six shafts at once, the centers are offset from each other so that the cutters can remain in line on the arbor and all commence to cut at the same time. When the opposite hand groove is milled, the head block is turned bottom side up, thus reversing the direction, the footstocks being adjusted accordingly. A hand milling machine, for example, may be adapted to cutting the teeth of three beveled pinions at the same time, an automatic indexing arrangement being provided.

Welder for Heavy Work

A spot welding machine, especially designed for heavy work is shown in the accompanying illustration. The parts to be welded on this machine, were too heavy to handle conveniently, rendering it necessary to make the welds without changing the position of the stock. Three different kinds of dies are used without moving the stock after it is placed on the lower horn of the welding machine.

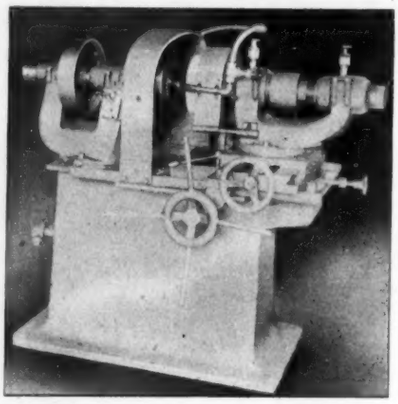
The upper part of the machine is arranged with the die points mounted on a swiveled head. A weld is made with one die, the second is then swung around to strike the stock in a different place and the third die then is used to make a weld in another spot, all of the welds being made within a radius of 4 inches. The stock is then removed, the next piece inserted and the welds are made in the reverse order.

The machine is designed for welding 5/16-inch stock. The time consumed in making the three welds called for in each section, including shifting the die points, is said to be 12 seconds. This is claimed to be only a fraction of the time formerly consumed in handling this work. This welder was built by the Toledo Electric Welder Co., Cincinnati.

Grinder of New Type

The Bridgeport Safety Emery Wheel Co., Inc., Bridgeport, Conn., is now marketing a new style of grinder, especially adapted for grinding piston rings, washers, ball bearing races and similar work, in addition to all kinds of concave and convex faces. As the headstock is pivoted on the base of the machine, convex surfaces may be obtained by swinging the headstock through a slight angle.

The machine is of the magnetic chuck type and may be provided with any size chuck up to 14 inches in diameter. This grinder has a traveling table mounted on the bed. The table, in turn, is provided with a cross slide on which



GRINDER OF NEW DESIGN

is mounted the carriage. The grinding wheel head is pivoted on the carriage and may be tilted, permitting the grinding, when necessary, to be done with only one side of the wheel, thus eliminating scratches and resulting, it is said, in exceptionally smooth work. Cup wheels are used entirely. These are provided with guards which can be adjusted back as the wheels are worn away.

The bearings for the grinding wheel spindle are of the taper sleeve type and are provided with check nuts; thus the taper sleeves when necessary can be drawn up to compensate for wear. For simplifying the feeding when grinding duplicate pieces, the end of the traverse table is provided with a regulating screw. A collar on this screw engages a shoulder on the base of the machine; by setting the screw properly, the depth of feed automatically will be the same for each piece. Both traverse and cross feeds are secured through hand wheels. Water is used as a cutting lubricant.

Using the Sales Engineer at Home

How the Employer Profits From His Services—Making Sales and Cutting Costs Under Your Own Roof—Last of Three Articles

BY ALBERT A. DOWD

THE importance of the services of the sales engineer to the manufacturer by whom he is employed can hardly be over-estimated. In his influence on general sales and the design of machines, in keeping up a customer's interest, in helping salesmen to get in touch with prospective purchasers and in many other ways he is of value. In the preceding articles in this series we have considered the engineer's relation to the customer and to the salesman, and while in both of these connections, his work affects the manufacturer by increasing business and enabling the salesman to get in touch with prospects, there are many other ways in which his services are of vital interest.

In the modern machine tool factory, visitors who may be future customers, or those who have already installed machines of the types made by the company, are welcomed by the officials. Often they are desirous of obtaining practical demonstrations of the methods in vogue where the tools are built. In many cases the salesmen are on the road and therefore are not available to point out features of interest, so that it not infrequently happens that the sales engineer is selected to make the visitor's stay a pleasant one and to give him such information as he may require. Acting as a guide, the engineer takes the visitor through the plant; he points out interesting devices for manufacture, shows the assembling methods, etc., and finally brings the visitor to the department devoted to the type of machine tools in which he is particularly interested.

Here an ocular demonstration of the value of the machines is afforded the visitor and his attention is called to various features in construction, convenience of operation, power, feeds and speeds, lubricating devices, etc., in such a way that these points are emphasized by noting their value in actual use. It is quite likely that there may be work in process of a similar character to that in which the visitor is interested, and in such an event the sales engineer, on account of his experience, will be able to show off the machine to good advantage. He can point out the methods of setting up the work, the ease of control and the rapidity with which the work is handled, and in that way can show the points of superiority which the machine possesses over others of similar type. The impression gained by the visitor is therefore a favorable one. In factories specializing on one or two types of machines, the office of the sales engineer is often very close to the department where the machines are being used, and when the class of work produced is of not too cumbersome a nature, racks may be provided which contain samples of work done at various times. In one case in the writer's knowledge, samples of work are kept in these racks, carefully tagged with a card giving the customer's name, name of the piece and production time. Shop order numbers and estimate numbers are also given so that it is an easy matter to look up the layout of tools for any piece of work which is of special interest. By showing the visitor some of the sample pieces he is enabled to realize in a thorough manner the value of the machines as applied to his own work, and the production time given on each tag will many times bring up the matter of the tooling employed to produce such results. It is quite possible that the visitor may be a trifle skeptical regarding the time in which some of the work has been produced, and here the sales engineer gets another chance to show the value of the methods used.

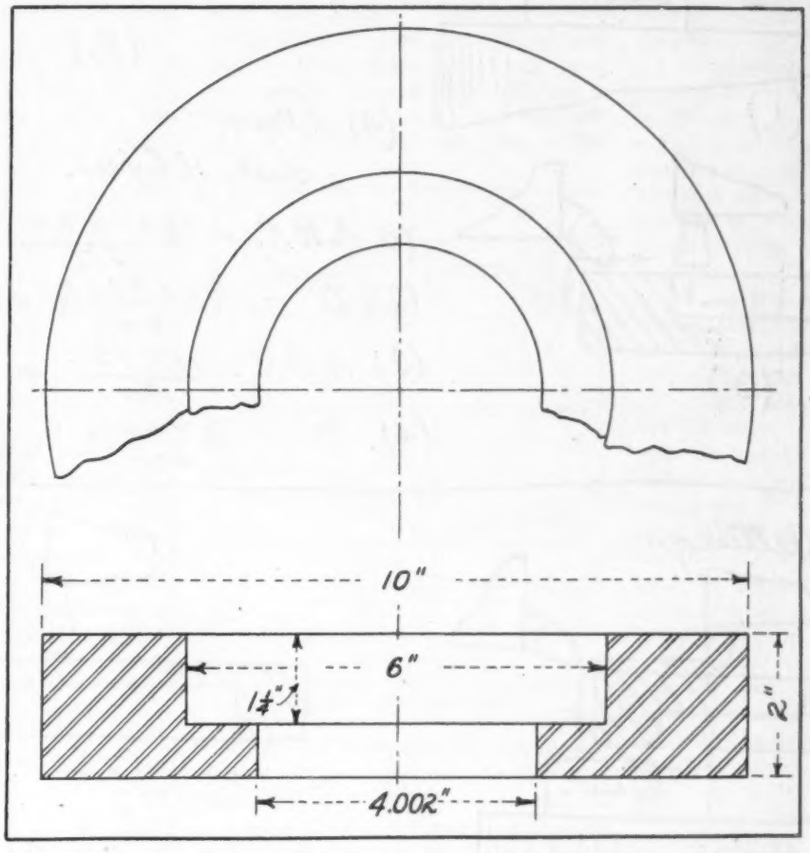


FIG. 1—SKETCH OF PART ON WHICH THE VISITOR WANTED AN ESTIMATE

Taking the visitor into his office, he looks up one or two of the tool layouts used in connection with the manufacture of the samples shown, and gets out the estimates of production and time studies on which they were based. It is pointed out to the visitor that the

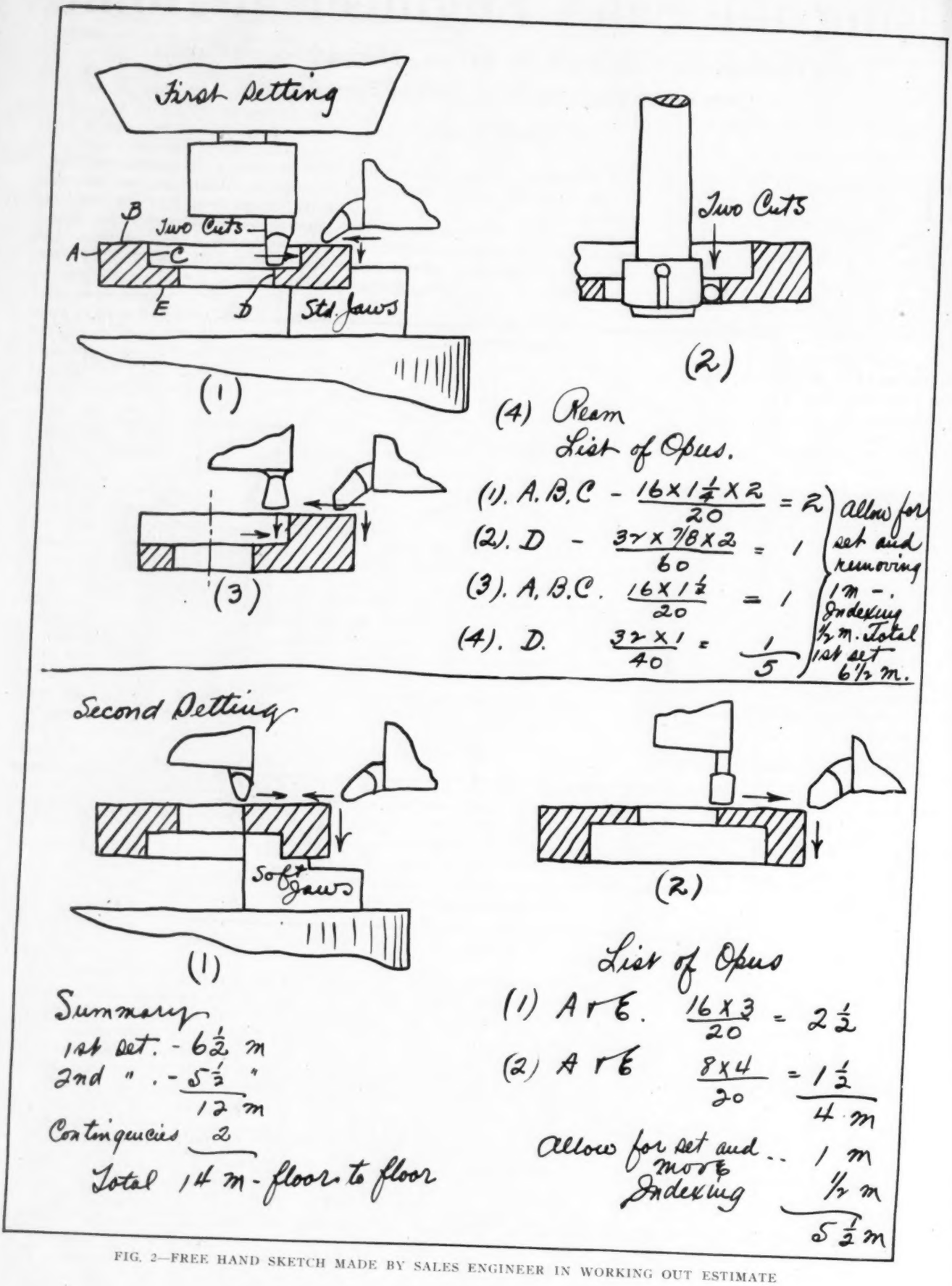


FIG. 2—FREE HAND SKETCH MADE BY SALES ENGINEER IN WORKING OUT ESTIMATE

time studies are carefully figured in connection with the tooling arrangements and all feeds and speeds given on the study, together with necessary allowances for setting up and removing work, indexing, regrinding and re-setting tools, and even setting up the machine in the first place ready for the work. He is shown that all ordinary contingencies likely to be met in manufacturing are taken into consideration, so that a production estimate really means something and is not a piece of guess work. He is informed that piece work prices can be based on the estimate of production, with a reasonable assurance of their being very close to the mark. After he has seen the inside working of the department devoted to estimating, he is naturally impressed with the practical way in which the problems of machining are worked out and may even become enthusiastic over it. Perhaps he may say, "Well, I have a couple of blue-prints of some of my own work in my pocket, and I'd like your opinion on the length of time necessary to machine them on one of your type of machines."

He hands over a blue-print of a piece shown in Fig. 1 and says, "I put these pieces through in lots of 100 about three or four times a year, so I don't wish to go to the expense of anything very special in the line of tool equipment, but would like to know low long it ought to take to machine one of them with regular equipment."

The sales engineer replies. "Well, I can give you a rough estimate in three or four minutes, which will be very close to the mark. Will that do or do you want a careful layout and time study?" The visitor says that a rough estimate will be near enough for present purposes and watches the engineer with considerable interest while he roughly outlines the method of handling with a freehand sketch, Fig. 2, lettering the various surfaces, and on one side of the paper figuring the time necessary for making the cuts according to speed and feed. The work is rapidly done and the engineer says, "I should say from 14 to 16 minutes for each piece would be sufficient, and if handled in lots of 100 you could safely figure on a production of three pieces an hour, including the time of setting up the machine. A piece work price of 15 cents each would give the operator a chance to make a good day's wages."

Improved Methods Cut Costs

"Why, we're paying 40 cents apiece for them now, and the operators are only just about coming out clear," replies the visitor, and looks as though he didn't believe it possible. Having seen some of the work in process however he is not as skeptical as at first, and after a little more conversation regarding some of his other work, he goes back to the main office very much pleased with his visit and thoroughly convinced of the ability of the sales engineer and the adaptability of the machines manufactured by the company.

The courteous treatment which he has received and the demonstrations he has seen of the thorough manner in which all branches of the work are attended to, incline him very strongly toward the machines made by this company, so that when he is ready to buy, he will naturally give them the preference. In addition to this he will undoubtedly tell others of what he has seen so that his visit may actually result in several future sales. It will readily be seen that the sales engineer has been of great assistance in a case of this kind, both in interesting a prospective customer and also in giving him confidence in the

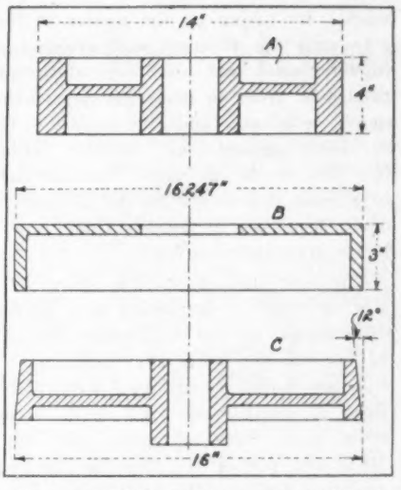


FIG. 3—THREE PARTS ON WHICH TIME WAS SAVED

company and its methods, so that he will feel as if he might rely on the estimates.

Another way in which the sales engineer is of great use to the manufacturer is in breaking-in new salesmen or agents by making them thoroughly familiar with the methods in vogue, and in giving them points regarding manufacture, etc., which are of value to them. In the advertising department also, data are often required both for catalog work and for the trade papers, which can only be found in the sales engineer's files. For this reason, the system which he uses must be flexible, and his card indexes and files must be so arranged as to entail as little trouble as possible in finding drawings or estimates.

Many of the improvements in machine tools are the direct result of suggestions made by the sales engineer, and in this way the manufacturer is vitally affected, because if he does not keep his machines up to date, he will eventually lose business to more progressive concerns. The sales engineer being continually in touch with the problems of manufacturing, finds the points in the machine which are capable of being improved, and is often enabled to make suggestions which lead to improvement in design. Sometimes the suggestions for a change are worked out by the engineer, while in other cases the faulty construction is simply pointed out to the chief engineer with a request that the matter be looked into and changes made if possible. Occasionally the changes suggested seem like very small matters, and yet they may, if neglected, have a far-reaching effect on the sale of machines.

I remember an instance of this kind a number of years ago which will serve to illustrate the point. One of the engineers in charge of production work, had several times called attention to the fact that the outlet for lubricant in the pan of the machine was in a position almost directly under the spindle, so that the chips soon clogged up the screen and prevented the lubricant from running back into the tank. The operator in charge of such a machine was obliged to spend quite a little time and undoubtedly some profanity every half hour or so in cleaning the chips away from the outlet. For several years no change was made in the design to remedy this defect until finally an order came in for 15 machines of this type with the stipulation that the pan design must be changed sufficiently to insure a free passage for the cutting lubricant back to the tank. The company sending the order already had a battery of machines and had found the same trouble with chips to which the engineer had called attention several times, and they had found it so serious that they made the order with the stipulation mentioned. Needless to say the design of the pan was changed as the sale amounted to about $30,000.00. The pattern changes were considerable, in order to obtain the desired results but after it was once changed, the expense was no greater than before.

How Attachments are Developed

Attachments for forming, turning tapers, convex and concave work, are frequently developed from suggestions made by the sales engineer and often become standardized to a certain extent so that they are made up and kept in stock. The feeds and speeds on various machines are occasionally found unsuited to the most rapid production on certain classes of work and are subject to changes to suit the conditions, when the construction of the machine will per-

mit. Other changes in construction pertaining to convenience and rapidity of operation are often the direct result of suggestions made by the sales engineer.

Mention has been previously made of the sales engineer's value in keeping up the customer's interest by enabling him to get maximum production out of his machines, and in giving expert advice regarding the machining of difficult work. This matter also naturally affects the manufacturer by making the customers so well satisfied that they have an actual advertising value and assist in the sale of other machines by speaking enthusiastically of the work being done in their own factories.

It is a lamentable fact that many manufacturers employ an expert sales engineer who is thoroughly up-to-date in matters pertaining to production for the benefit of their customers, and yet allow the work in their own factories to "jog along" in the good old fashioned way. This is very much like the man spoken of in the Bible who sees "the mote in his brother's eye, yet perceiveth not the beam which is in his own eye."

If a sales engineer is capable of showing a customer how to produce his work to the best advantage, why should he not also be of use to the manufacturer in the same way? Of course his work is primarily for the customer, but he can be of great assistance to the manufacturer in a number of ways, especially when the season is a trifle dull and in many factories his experience and advice in production methods has been found profitable. He need not conflict with the tool designer in the least, for although his work has much to do with tooling arrangements, the working out of the details is usually left to the tool designer. A harmonious arrangement between these two men and frequent consultation on knotty problems will result in a marked improvement in production methods throughout the factory. In one of the largest machine tool factories in this country the sales engineers are frequently called upon to look into matters of production in the various departments which use the machines on which they are specialists, in order to keep the productive efficiency at its highest point.

Cashing in on the Sales Engineer's Experience

A few years ago the writer was called upon during a season of dullness, to investigate production methods and take steps to improve them when possible, in the turret lathe and chucking departments of a large factory making machine tools. Some of the steps taken and conditions met with may be of interest as showing the application of the sales engineer's knowledge to problems in the factory where he is employed. Several months were intermittently spent in the work without sacrificing any of the regular estimating and time study labors which affected the customers.

It can readily be understood that it is a somewhat delicate task to approach a department foreman on the subject of improving his production, especially if the foreman has been in charge of the department for a number of years. The matter was first taken up with the foreman by the superintendent, and he was given to understand that the idea was to do for his department what was already being done for customers, so that the department might be used as a sort of demonstration room in connection with the regular work. Prospective customers would then be able to see the machines at work under actual shop conditions with tooling such as they could reasonably expect on their own work. By taking up the matter in this way with the foreman and giving him to understand that his co-operation was needed in order to make the department more efficient and up-to-date, the prejudice against "an outsider telling him how to do his work" was softened to a great degree and he did all that he could to assist in putting things on a better manufacturing basis.

The first day or so was spent in a sort of visit of inspection and general examination of the department methods in conjunction with the foreman. It was noted that speeds used were rather slow in many cases and feeds somewhat finer than necessary, but when asked the reason for this the foreman said that many of the tools were of carbon steel. The tool "crib" was found well supplied with tools (such as they were), but the system by which they were kept up was slip-shod. A few suggestions were made regarding a better method in the "crib" and a talk with the superintendent regarding the use of carbon tools in cast iron and steel chucking work resulted in a gradual replacement with high speed tools.

The tooling arrangements were found in some cases to be fairly good on both horizontal and vertical chucking machines, although little heed was paid to making tool combinations so as to have as many tools as possible at work at the same time. A few cases were found where the operator seemed to have little idea of the principles of tooling, and tools were put in "hit or miss," without much regard to proper sequence. An instance of this kind was found in machining a pulley on an old fashioned octagon turret chucking machine. The operator seemed to think that because there were eight turret holes he must use some kind of a tool in each of them, and with all this multiplicity of tools the work varied so much that a final operation of hand reaming was resorted to in order to size it correctly. Four tools were substituted for the eight which he had been using and the work was produced accurately and quickly.

A number of free-hand sketches showing better methods of tooling were made for a number of pieces of work in process, and carbon steel tools were replaced by high speed as fast as possible with a noticeable gain in production. Some of the work was machined in lots of 100 pieces or so, three or four times a year and the piece work prices were very high because special tooling had not been deemed advisable. These matters were taken up with the superintendent and suggestions for rather simple special tooling were made in order to increase the production.

These tools were built from time to time and used when the next lots of work were put through the factory, with the result that the piece work prices were greatly reduced. This occasioned a kick on the part of the operators to whom the work was assigned, several of them being on the point of quitting. After setting up the tools and machining one or two pieces with the new equipment, however, they were convinced, somewhat against their wills, that they could still make a good day's wages without any more exertion than previously, so that the cut in prices was not as serious a matter as it first appeared. In the cases where improvements in setting up the work and better tooling arrangements were made, the piece work prices were also correspondingly reduced, and as feeds and speeds were carefully looked into at the same time, an increased efficiency was apparent throughout the entire department.

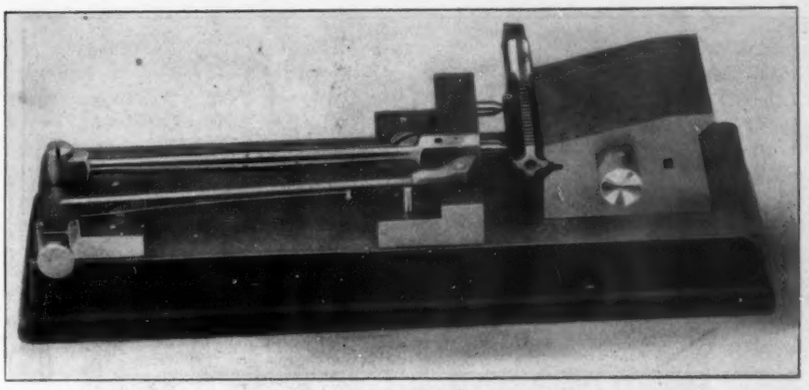
Specific Examples

Several of the pieces on which great improvements in manufacture were made are illustrated in Fig. 3. The upper piece *A* was cast iron finished all over on a horizontal turret lathe, but no great degree of accuracy was required except the hub hole which was machined within a limit of 0.001-inch. The remainder of the piece simply called for a good commercial finish and a polished rim for appearance only.

By the method used before the sales engineer was called in, this piece of work took from 1¾ to 2 hours, and the piece work price was 90 cents each for the turret lathe work. By the use of special tools, and taking advantage of

(*Continued on page* 946b.)

Screw Lead Indicator



SCREW LEAD INDICATOR

The subject of greater accuracy in screw threads is receiving considerable attention. Thread micrometer calipers, as produced by several well-known manufacturers, provide the means of obtaining exact diametral measurements. Accurate diametral pitch, of itself, does not, however, guarantee a perfect fit. It has come to be recognized that the longitudinal pitch, or lead, is important in securing good screw fits. The Remington Tool & Machine Co., Boston, has made a number of screw lead indicators in the past for concerns who maintain close screw standards, and is manufacturing for the general market a lead indicator, the features of which are shown in the accompanying illustration. It is notable that substantial reductions in assembling costs has followed the practice of gaging all threaded parts made, or purchased, including taps. The cost of fitting and resizing inaccurate screws retards assembling production and represents work that is available if accurate standards are adhered to. The hardened 60-degree points are spaced either ¼ or 1 inch apart. The screw holding block is milled to handle both small and large diameters. Standard plugs accompany the indicator for accurate spacing.

Cutting Bars for Shrapnel Shells

IN THE accompanying illustration is shown a cold saw cutting off machine, designed to handle and cut off steel bars to proper length for making shrapnel shells. The machine is built by the Epsen-Lucas Machine Works, Philadelphia.

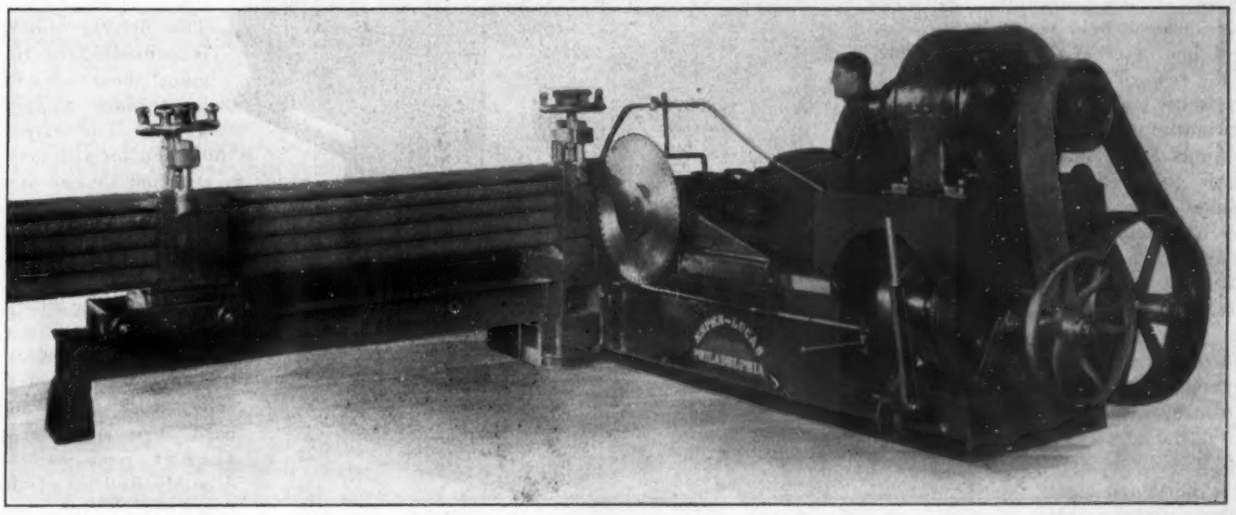
The tool has feed and speed variations permitting the sawing of materials at a rate as high as 5 inches per minute. Any feed may be used, as the cutting capacity of the machine is limited only by the nature of the material being saved.

The drive is through a main shaft, phosphor bronze worm wheel and crucible steel worm, running in oil. The spindle extends the entire width of the saw carriage. The saw blade is bolted directly against the driving gear, insuring rigidity and diminishing torsional strain between the gear and the saw blade.

The saw carriage has a feed from ½ inch to 5 inches per minute, which is obtained through a friction plate controlled by an automatically locked hand wheel. Any change in cutting speed may be made while the machine is operating. The saw carriage also has quick return mechanism, controlled by the same lever and effecting any change in cutting speed desired. An automatic stop for controlling the travel of the saw carriage is provided. A large number of these machines have been shipped abroad and many are being used by the manufacturers of shells in this country.

In drilling for taps do not try to allow a full thread unless absolutely necessary. Don't forget that a half thread in a nut is stronger than the bolt or screw. By not allowing a full thread, the taps require much less power, seldom break and can be more easily started square with the hole.

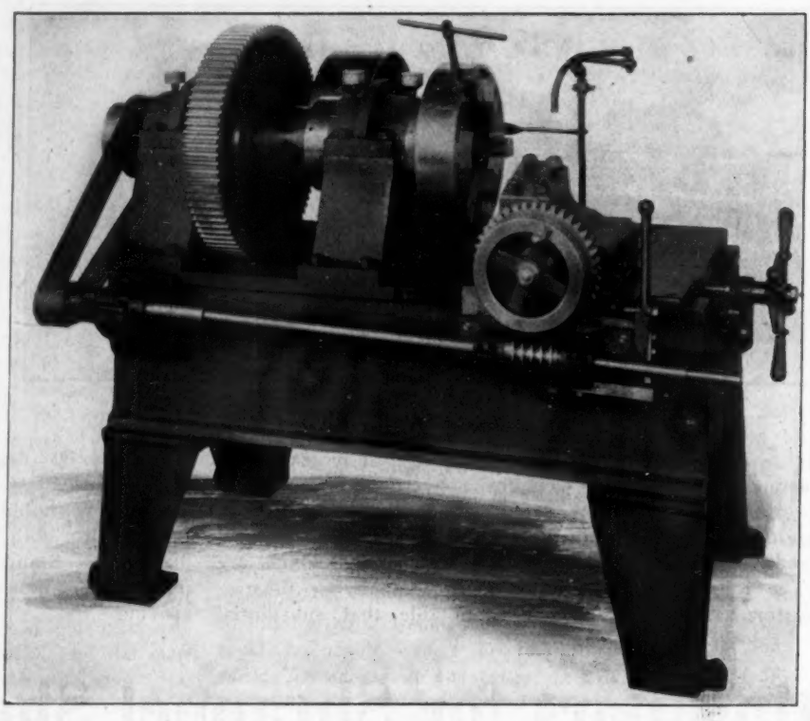
Ball bearings must be protected from dust, grit, rust, moisture and acid. All of these things injure them.



COLD SAW FOR CUTTING STEEL BARS FOR SHRAPNEL

New Cutting Off Machine

A special cutting off machine, designed for manufacturing shrapnel shells, has been built recently by the Williams Tool Co., Erie, Pa., for the Electric Steel & Metals Co., Welland, Ont. The bed of the machine is rigidly constructed and weighs about 1,200 pounds. The boxes carrying the driving shaft are cast solid with the headstocks. The gears are coarse pitch. The driving pinion is steel. The driving shaft is 2 inches in diameter and operates at a speed of 250 revolutions per minute. The driving pulley is 14 inches in diameter and is designed for a 6-inch belt.

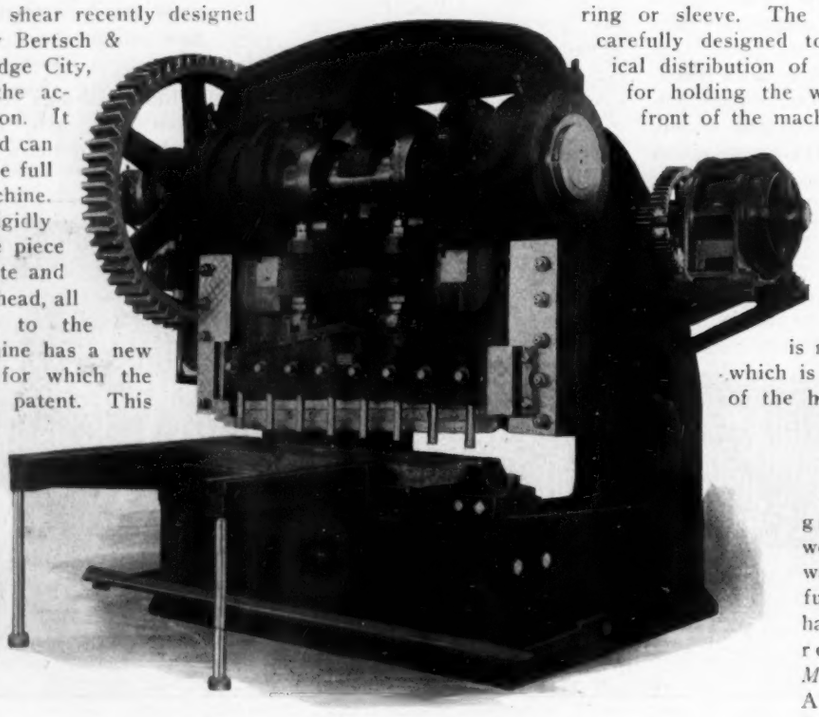


CUTTING OFF MACHINE FOR MAKING SHRAPNEL

The spindle speed of 50 revolutions per minute gives a cutting speed of about 65 feet per minute. If desired, the machine can be speeded up as the bearings are of sufficient length for double the ordinary speed. The spindle is bored to 5⅛-inch diameter. The chuck is of the three-jaw type, the jaws being 1⅝ x 3 inches. The tool carriage is said to be of rigid construction and may be traversed by screws operated by a small hand wheel. The tool block is mounted on a V-slide gibbed in place, and has bearings of 12 inches on the ways. The cutting tool is ⅛ x 2 inches and is set at an angle of 15 degrees in the tool block. The tool is held in place by a steel cap secured by four ¾-inch studs. The machine has both hand and power feed, the latter being transmitted through a worm and gear. The Williams Tool Co. expects to build a larger machine, weighing about 4,500 pounds for use on 6-inch shells. Special attention is given to the lubrication of the machine, the main spindle bearings being provided with three large grease cups.

Heavy Gate Shear of New Design

A HEAVY gate shear recently designed and built by Bertsch & Co., Cambridge City, Ind., is shown in the accompanying illustration. It has 72-inch blades and can cut 1¼-inch plates the full length of the machine. The shear is held rigidly by a bed, a cross-tie piece in the rear of the gate and a cross-tie piece overhead, all substantially bolted to the housings. The machine has a new toggle joint clutch, for which the builder is seeking a patent. This clutch is said to be positive, noiseless and automatic. It is actuated on the toggle joint principle, which increases the engaging pressure, and insures full contact of the jaws. The clutch is disengaged by a hardened steel roller acting against a cast steel switch ring or sleeve. The heavy cast frame is carefully designed to insure an economical distribution of metal. Slotted skids for holding the work are provided in front of the machine; as shown in the illustration, they are supported by finished steel rods. The driving motor is connected to the main shear shaft by a train of spur gears. The motor is mounted on a bracket which is attached to one side of the housing.



HEAVY GATE SHEAR

Welfare

The men who achieve great things in the world are not clock-watchers. They cheerfully work long and hard, it is stated in a recent issue of the *Monthly Bulletin* of the American Iron and Steel Institute. Yet it

is natural and right that employes should desire and have regular and reasonable working hours. But the shortening of hours has its dangers as well as its delights. Shorter hours may be a curse instead of a blessing. The proverb, "Satan finds some mischief still for idle hands to do," is as true as it is old. To use leisure properly requires wisdom.

In a recent letter, an officer of a West Virginia coal company said:

"We realized that our own men were becoming dissatisfied, not so much as to the wages we were paying, but more on account of unrest. . . . . Upon investigation, we found their money was being squandered. Our paydays were disgraceful. Drunkenness was a common occurrence. . . . Whenever the mine was idle, time hung heavy on their hands. These periods of idleness usually brought about disastrous results."

The company then undertook to provide for the men's leisure hours. Good schools were established and comfortable homes were built; the making of gardens was encouraged and a baseball team was organized; and other things were done to promote the health and happiness of the employes. This officer now reports:

"It is hard to estimate in dollars and cents the real efficiency brought about by this work. We find the men who are now in our employ are just as particular about a new man coming in as the company who is employing him.

"There is no room for a bum, nor for a man who does not want steady work. We have absolutely no drunkenness. The company and the men live as one large family."

Sparks from the Grinding Wheel

By H. O. Tair

It is not often given to us to witness an exhibit that covers the entire scope of the iron and steel industry, but the United States Steel Corporation affords this opportunity at the Panama-Pacific Exposition. Furthermore it is remarkable that this exhibit is of wide interest and educational value to the layman in that it shows the how and the why.

* * *

Henry D. Baker, our commercial attache at Petrograd, says that at home our salesmen are absolute wonders, but that when they go abroad they evince a "disposition to flirt with their opportunities." This calls for proceedings in rebuttal by our machinery salesmen right now! Are the defendants ready to proceed?

* * *

How the efficiency engineer's heart must have leaped at the recent announcement that the new boiler code has been approved. Long years of hard work have been consummated in a field of endeavor almost second to none. Here is immense opportunity for that co-operation and co-ordination of the efficiency folks. All honor to Ohio as the first state to take the initiative in approving the new code!

* * *

If our machinery exports can gain an increase of 300 per cent in 17 years, with Europe as our largest buyer—and if we will adopt our Canadian neighbors' quick, businesslike methods—what a chance the future should open up to us. Let us act wisely and quickly.

* * *

Spectacular transactions, whether in Wall street or in the machinery market, are, after all, but business pyrotechnics; they flash and disappear. We must look for the steady, if slow, increase of orders that are the real harbingers of business that sticks and stays stuck.

* * *

Of what real use is all your "Safety First" efforts to safeguard your men against the accident hazard, if your shop is an island in a sea of saloons; if your employees can "sneak out" in working hours and return in a condition to imperil the safety of their fellows? The coal mine operators handle the "booze" problem well, and it would pay every employer in the iron and steel industry to study the former's methods. The work of the one is wellnigh as hazardous as the other.

* * *

There's a subtle bit of humor in Sam Gompers' denial that his fellow labor leaders will seek to use the influence of their forces in stopping the war in Europe. He says he hopes that the day will never come when "the capabilities of organized labor will have been fully tested. Now you can take this statement either way.

* * *

The desire to clamber up on the band wagon is evidently increasing among the railroads. According to the news reports, the Pennsylvania will spend $20,000,000 for locomotive and car material, and President Thomas of the Lehigh says his people will put $1,000,000 into improvements. This is the modest beginning of a list that will be much welcomed when it acquires more length.

* * *

In fastidious political circles, umbrage has been taken at the expression "ripper bills" instead of "remedial legislation." The latter is more dignified, but "ripper" seems to more nearly hit the nail head. Like the fat man, we are sore afraid these days that at almost any moment something is going to rip unless our legislative tailors allow us more latitude.

* * *

A newspaper says that Bethlehem Steel is the Billy Sunday of Wall street. If Billy's spiritual stock ever rises as has Bethlehem Steel recently, we'll all hit the trail. Billy has a good many fine points, but he seems to be "frenzied by success" and his method is hotter than a blast furnace.

* * *

What is there in the legal profession that gets it so many positions of management in commercial and governmental affairs? You or I, in order to fit ourselves to direct, say, a huge machinery business, must first begin at the bottom and learn its every detail before we can possibly undertake its direction. To my mind, government is an immense machine shop, molding, finishing and putting into the field the business of the whole nation. Business men can operate all our affairs, but—there must be more practical inducements offered them than honors alone.

* * *

It is easily understood why a "banker" who has sojourned at Leavenworth or Atlanta should want the comptroller of currency's office abolished. He, the comptroller, will never equal Jess Willard in popularity, but nevertheless he ought to show some discretion—at least enough to keep his administration out of hot water!

* * *

If Richard the Third could command the business forces now entrenched along our line of industrial battle, would he still shriek for that historic equine steed? Not very much! The dogs of our commercial conflict are the ocean greyhounds, but a succession of senseless congresses has left us wellnigh without a kennel.

* * *

Those peace folks, the International Peace Brotherhood — evidently as a rebuke to our lately acquired shrapnel and ammunition industry—have started a factory in New Jersey. Just why the sometimes belligerent automobile is included in their output is beyond me. More appropriate to their purpose would be safety matches, or knitting, or mottoes. Some day we'll have peace even, as Cassidy said, if we have to fight to get it.

* * *

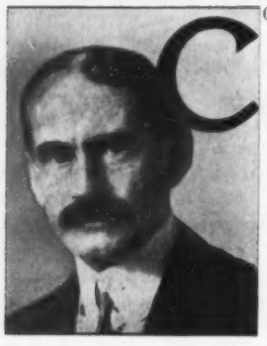
Is America to become the common center of international trade? Why not? Old man Opportunity is knocking loudly at our gates and our good old American dollar is at a premium. The pound, the franc, the reichmark (and doubtless the yen and the kopek) are now at a discount. As we cannot easily go to Europe during the war, let Europe come to us—and in time she'll like our brand and refuse to take any other.

Turn Limelight on All Regulation

And on Legislation Relating to Business

Organizations Representing Commerce, Labor and Industry Urged to Unite in Spreading the Truth—An Address Delivered Before the Youngstown Chamber of Commerce Tuesday, May 4

BY T. W. ROBINSON
First Vice President of the Illinois Steel Co.



COMMERCIALLY speaking, things are and for a long time have been, badly out of joint in this country. The present unsatisfactory conditions, while influenced by the war, can by no means be attributed to the war. Our crops have been unprecedented in volume and high in price. Our financial condition was never stronger. Labor and capital are anxious to perform their service. Yet many of our mills are idle, and hunger and want are in our land. Why, then, when our basic conditions are sound, are the energies of our people atrophied, and their activities repressed? Before attempting to answer this question, let us briefly consider some of the conditions and principles underlying the present situation.

Any intelligent study of the principles underlying business must recognize certain psychological truths. We must recognize that 99 per cent of men are innately honest. We must also recognize that 99 per cent of men are innately selfish. We must recognize that human activity is based essentially on a struggle to gain something that one has not, and oft-times, unfortunately, to gain something that the other has. There is ever a struggle between the conservatives who have and the radicals who do not have. It is this trait in human nature that was the basis of the French revolution, and it is the same trait that is the basis of the economic revolution through which we have been passing in this country.

The intelligent study of business must also recognize certain elementary economic laws. The commercial activities of men are concerned with the production of wealth and with the distribution of wealth, and the principles governing the two are often confounded. Wealth in all its ramified forms must originally be won from natural resources by the co-operation of labor and capital. The wealth of a nation is the composite wealth of all its people, as the character of a nation is the composite character of all its people. Accordingly, any agency that increases the productiveness of men's effort, whether it be the power of machinery or the power of organization or business method, is of general benefit to society.

Changes of Fifty Years

FIFTY years ago, our industries were by the very nature of the material limitations then existing comparatively small and isolated. The partnership was the ordinary form of business association, and concentration of both capital and labor was relatively unimportant. The hours of labor were long and the rate of wages was low. Our actual and potential wealth lay mainly in our agriculture, and communication and transportation were slow and costly. Today we are an industrial nation, and our economic and social conditions have been revolutionized, largely through the development of the telegraph, the telephone and the steel rail. Two hundred and fifty thousand miles of railway people our former vacant lands, aggregation of capital has reached unparalleled proportions, our population has increased threefold, and our wealth has increased ninefold. With such power and accomplishment, how comes it then that we are in the slough of industrial despond? The answer may be given in two words—uncertainty and fear; uncertainty as to what can properly be done by business, and fear that something may be done inimical to business.

Confidence Necessary

THE prosperity of a nation is clearly dependent upon its general industrial activity. Industrial activity in turn is dependent upon confidence. In order to maintain confidence, men must have faith that honest effort and honest intent will be permitted under the law to reap a reasonable reward, and that the wealth produced will be distributed with reasonable justice to all concerned. If industry cannot make a reasonable return on the capital invested in farm, railroad, manufacture, or public utility, activity ceases. If, moreover, the wealth from industry is unjustly obtained, or if honestly obtained is unjustly distributed, the force of public opinion will stop the wheels of industry. No matter how sound conditions may be, if there be not confidence, the blight of distrust will kill prosperity.

There is today general timidity on the part of investors, and we too often fail to realize that the small investors are our true capitalists, and that the wealth of this country lies essentially with them. Even our so-called captains of industry are but trustees of the small man's property, and we are all directly or indirectly interested, through our investments, insurance, and daily wage, in the prosperity of incorporated capital, any blow at which strikes the small man infinitely harder than it does the large man. Five per cent of our people perhaps can live on their accumulated or inherited wealth. The 95 per cent, however, must work; and to be able to work, our industries must be active. It would be well if our citizens more generally recognized these facts, to the end that better co-operation might be had between the government and the people.

Problems Following the Civil War

NOW, our present commercial troubles are largely the inheritance of former years. The problems that followed our civil war were pre-eminently problems directly or indirectly dealing with the production of wealth, and our national energies in legislation and in invention were then largely directed toward that end. Business which before had been essentially intra-

state in its scope, became more generally inter-state in its character. Small corporations gave way to large corporations, and the centralization of industry, on account of its increased efficiency, became more and more accentuated. In the trusts that followed, we find not only an economic agent for the production of wealth, but a method of distributing wealth which was sharply challenged.

The nation became aroused, not more on account of what had been done than because of fear of what might be done by large aggregations of capital. Our legislative bodies, following the temper of the people, turned from permissive legislation looking toward the development of industry to restrictive legislation looking toward the division of the reward of industry. For want of proper co-operation, class became arraigned against class, and the innocent suffered more than the guilty.

It would be folly for business to deny that abuses crept in with the early centralization of industry, and that if our form of government was to stand, they had to be corrected. It would likewise be folly to attempt to justify some of the economic doctrines upon which regulation has been attempted, or to excuse the ignorance, if not vindictiveness, with which some of the regulation has been undertaken. We reap what we sow, and in the ignorance and selfishness of the past we largely find the seed that is giving us today our harvest of discontent and industrial demoralization.

Interpretation of Federal Laws

TWENTY-EIGHT years ago, the government, through the interstate commerce law, gave notice that no private interest was above and beyond an obligation to the whole community. Three years later, the government, through the Sherman anti-trust act, began its effort to control or limit combinations between competing companies engaged in commerce. At first the law was construed to prohibit all combinations which directly restrained competition. Then the Supreme Court decided in the Standard Oil and Tobacco cases that the law condemned only combinations which unreasonably restrained trade. Later, the International Harvester Co. was ordered dissolved by a district court because it has acquired too large a proportion of its special business, and recently, in the Keystone Watch case, a district court refused to dissolve the company because size is not a crime under the Sherman law.

How serious is such uncertainty and confusion need not be elaborated before a body like this. The fundamental difficulty lies in the fact that the Sherman anti-trust law as passed by congress was largely meaningless and experimental, and did not attempt to determine what there might be of good or evil in the trusts at which it was aimed. The practical questions involved in the law and in the decisions that have been rendered under it are essentially economic questions. The law did not advance any principles of economics, and the courts ever since have been trying to determine what principles of economics are good for business. There is certainly restraint of trade, but not of the character intended, and the Clayton bill will not remove the difficulty unless by the hearty co-operation of the federal trade commission and business.

The Railroads—Our Greatest Industry

WHILE general business is thus subject to the stress of grave uncertainty in respect to the law, a cursory inspection of the federal and state laws aimed at our greatest industry, the railroad, must convince any fair-minded man that some of the legislation has practically amounted to persecution. Recognizing that there were evils to overcome and mismanagement to be corrected, it is not necessary to kill in order to cure. Regulation should not mean strangulation, and neither bankruptcy nor government ownership is desirable for the American people. There is no other single industry upon whose activity and success the prosperity of this country so largely depends as the railroad, and the forcing of an unremunerative passenger fare or a freight rate that will not permit a reasonable return on the capital invested must ultimately injure the very people whose interests are sought to be protected. To compel the employment of men where no adequate return in service can be rendered, as is the case in the full train crew laws, or to fix a limit below the number of cars which a train could safely haul, means waste, and is a policy as shortsighted on the part of labor as is an attempt to compel unremunerative rates on the part of the shipper. The welfare of each individual citizen will, directly or indirectly, be enhanced by closer co-operation between the railroads, the commissions and the public.

The Tariff Question—How to Solve It

BUT business is not suffering alone from restrictive or regulatory legislation. The tariff has been a continued source of needless confusion and loss to both labor and capital. Whether the tariff be considered from a standpoint of protection to our industries or from the viewpoint of revenue only, it is clear that only by scientific investigation, through a permanent non-partisan commission or otherwise, can adjustment be made upon a proper basis. The tariff is essentially an economic question, and as such it should be taken out of politics. If our business interests will co-operate to that end and help to enlighten the public as to the facts and necessities of the case, the tariff can be removed from the plane of political expediency to that of business economy.

Germany—Its Marvellous Efficiency

MEN may differ in their theories, but no man can gainsay facts. The facts surrounding the marvelous efficiency of Germany and the phenomenal growth of her industrialism are impressive and worthy of the closest study. Germany is a striking example of the power of effective co-operation between government, labor and industry. With but 7 per cent of our land area, and with a population only 60 per cent as large as our own, Germany's imports and exports before the war not only exceeded those of the United States, but surpassed those of all other nations of the world, excepting only the United Kingdom. Germany believes in industrial centralization, gives freedom to combine as well as freedom to compete, and encourages her industry by a protective tariff. Let us keep clearly in mind that industrial centralization is the modern form of industrial co-operation and through its unquestioned economy and efficiency, centralization is just as much a factor in increasing a country's wealth as is any other labor-saving device.

Agricultural Possibilities

WHILE the intimate relation that exists between the character of our crops and the degree of our prosperity is generally realized, the public does not so well appreciate the rapid relative decrease that has taken place in the agricultural products of this country. From 1900 to 1910, our population increased 21 per cent, but our crop production increased in volume only 10 per cent, and the total farm acreage increased less than 5 per cent. Proportionately speaking, we have, therefore, been rapidly falling behind in our agricultural activities,

and it is extremely desirable that there should be a better understanding of the necessities of the case. In studying the ability of our farms to more nearly keep pace with our rapidly growing population, one is impressed with the productiveness of the soil of some of the European countries, even with land that has been under cultivation for more than a thousand years. I recently had a study made of some of our agricultural accomplishments as compared with those of Germany, and the difference in the yield per acre in the two countries in wheat, oats, rye and barley is strikingly significant. The following figures for this country are based on five year average returns for the years 1910 to 1914, inclusive, and those for Germany are for the four year average returns from 1910 to 1913, inclusive. In the period mentioned where we produced 14.9 bushels of wheat per acre, Germany produced 32.2 bushels per acre. Where we produced 30.5 bushels of oats per acre, Germany produced 54 bushels per acre. Our yield of barley was 24.5 bushels as against Germany's 38.3 bushels, and our production of rye was on the basis of 16.3 bushels per acre as against 28.8 bushels in Germany. But the most striking difference lies in the potato crop—and the potato crop in this country averaged in value during the past five years $213,000,000 annually. Our potato crop averaged 97.7 bushels per acre, while Germany produced 202.3 bushels per acre. In translating these differences in yield into monetary values, it is to be recorded that our average price during the past five years was 86.5 cents per bushel for wheat, 38.3 cents per bushel for oats, 59.5 cents per bushel for barley, 74.2 cents per bushel for rye, 59.3 cents per bushel for potatoes, and 57.6 cents per bushel for corn. With these prices, our crop of wheat, oats, barley, rye and potatoes during the last five years averaged $1,424,667,000 per year. Had the United States, however, commanded as good a yield as did Germany, the same acreage at the same prices would have given us a crop of the value of over $2,800,000,000, or an increase of $1,389,000,000. This, however, is not all. Our average yield of corn during the past five years was 26 bushels per acre. Ability to command a yield of 75 bushels per acre is not uncommon, and 300 bushels per acre has been accomplished. In view of these facts, an average yield of 50 bushels per acre does not seem to be impossible of attainment. Now, if our yield of 26 bushels per acre had been increased to 50 bushels per acre, the value of our corn crop during the past five years under the actual prices obtained, would have been $3,030,883,000 as against the actual value obtained of $1,573,039,000, or an increase of $1,457,844,000.

Summary of Crops Shows Us Lacking

A SUMMARY of these figures shows that the average annual value of the crops in question amounts to $2,997,706,000. If our yield per acre had been as good as Germany's yield, and if we could command an average of 50 bushels of corn per acre, the average value of these crops would have amounted to $5,844,885,000, or an increase of $2,847,179,000. In other words, our agricultural wealth obtained from these six crops would have been practically doubled.

Now, what have these figures got to do with co-operation in relation to business?

Everything, if one but recognizes the relation between increased wealth and business activity, and appreciates that only by the co-operation of the state and nation can agriculture be properly promoted by experimental stations and by the general establishment of agricultural schools in the rural districts. Only by such means can there be satisfactorily promoted a general farming intelligence that will favorably compare with that in Europe.

Public Education---Fundamental Problem

UNDERLYING all our social and industrial questions is the fundamental problem of public education. Over twenty millions of our people are in process of education. Of these, less than 2 per cent are in our higher institutions of learning, less than 6 per cent are in our high schools, while over 90 per cent are in our grade schools.

Adequate educational opportunity is manifestly vital in a country of political freedom, yet a large majority of the pupils in our grade schools are leaving at 14 years of age or younger, to go on the streets or into nondescript jobs, practically unprepared for their life's work. In seven years, these children will come into their political rights, and upon them, year by year to an ever-increasing extent, will depend our laws, the rights of property, and the supervision and regulation of our business. If a matter of proper education be viewed merely from the standpoint of material gain, it is an impressive fact that there are approximately 25,000,000 people in this country 18 years of age or over who are employed in farming, transportation and other industrial pursuits. It is safe to say that the vast majority of these people had no better educational opportunities than those presented by our grade schools. It is not unreasonable to believe that four years' training along practical industrial lines would have increased their earning capacity 10 cents a day. And 10 cents a day additional would be equivalent to increasing the wealth of this country $750,000,000 annually, an amount that is 50 per cent more than the entire annual cost of running the public school system of the United States. Or if you should assume that four years' practical training in agriculture or the trades would increase the earning power of the trained individuals 20 cents per day—not an unreasonable conclusion—the additional production of wealth would represent $1,500,000,000 per year.

From the standpoint of inculcating a higher type of citizenship and from the standpoint of promoting efficiency and morality as a guard against ignorance and crime, our men of affairs and our men of labor should co-operate with the state and with each other in providing for our youth a proper vocational training.

Coming Prosperity

THIS country is blessed beyond all other nations in its natural resources, and to even a high degree in its peace with the world. Good fortune is seldom builded on the misfortune of others, and it is unsound to predicate prosperity upon the loss of war. Nevertheless, the necessities of Europe and our own enforced economies are rapidly placing us in a position of world-wide leadership in finance and commerce. We shall have to pay our part of the destruction in Europe, but our share will be more than offset by the opportunities that are presented, provided our industries can be quickened by proper governmental co-operation. Let confidence be thus established, and nothing short of a national calamity can stop the prosperity that is knocking at our door.

The Need of Publicity

BUSINESS has no protest against just and wise supervision. We need publicity as to business methods, but we also need publicity as to the method and character of our business legislation, investigation and control. It has too often been good politics to attack business, and muckraking and demagogism too frequently have been based on public approval. The personnel of

our investigators has often been incompetent and prejudiced, and the character of our control has frequently been predicated upon false and uneconomic doctrines. Adversity, however, is a hard teacher, and this country is ripe for a widespread co-operative propaganda of the truth.

I want to urge that business more thoroughly co-operate in turning the limelight of publicity upon our business legislation and regulation. There will come a day when in the United States, as in some of the older countries, a seat in our legislative halls will be more generally sought as an opportunity for service and as a reward for superior qualifications and attainment. Right and reason will then more thoroughly prevail.

Organized Co-operation

IN THE meantime, can we not better use the means that are available for putting the people in possession of the facts in reference to prospective legislation, and in respect to the results of legislation that may have been enacted? It is no mere platitude to say that our government is a government of the people. If it were not so, our form of democracy would long ere this have gone into that discard where so many other experiments in government have gone. Ultimately our laws and our institutions are what the mass of our people decree they shall be. But of late our social and economic conditions have been changing with a rapidity never known before, and our national intelligence has not kept pace. In consequence, ignorance and class distinction have frequently replaced knowledge and sound judgment, and prejudice has too often been translated into laws inimical to the true interests of the community.

While selfishness and partisanship play their part in this result, our fundamental trouble lies in the difficulty of getting quickly and plainly before the people the facts in respect to our national and state problems. It is true that the public finally obtains the facts, and in the long run may be depended upon to act wisely, but how costly is the delay, and how difficult it is to inculcate and spread the truth is self-evident to any one who studies the economic changes and the legislation of the past 15 or 20 years.

The chamber of commerce of the United States centralizes the influence and activity of many of our national bodies of trade and commerce. Through them it represents at least 200,000 firms or corporations, and in addition 50,000 to 100,000 business men. In the past three years, its influence in Washington has been beneficial and far-reaching in many matters of national importance; it has a special advisory committee for co-operating with the recently appointed federal trade commission, and for the future it promises much for the promotion of truth and publicity in its efficient representation of industry.

Now, what is thus being done in respect to federal legislation, we should be able to do in respect to state legislation. Certainly no one who has to do with the activities of the usual state legislature can question the crying need of some potent, just and intelligent force to guide and check the mass of attempted or accomplished enactments.

In every state there are many organizations representing commerce, labor, trade and industry, each with its own peculiar functions and duties. It may be Utopian to suggest that, without detracting from their duties, such organizations could generally unite in each state to form a small, non-partisan centralized body for promoting publicity in respect to the men, doctrines and methods involved in state legislation affecting business. The fundamental object of such a body should be to determine and disseminate the truth, and its purpose should be to help construct sane legislation to the end that true progress be achieved in making our laws square with the needs of the times. If these centralized bodies in each state should unite by national federation, or should co-operate with the chamber of commerce of the United States, there could be effectively accomplished an organized campaign of education and publicity that would eventually go far toward obtaining just co-operation between government and business.

The Spirit of Co-operation

AND now in conclusion, let us recognize that absolutism in business is archaic, and that ruthless competition is barbaric in its waste, that liberty in the exercise of property rights does not mean license, nor is unjust restriction compatible with the public welfare.

Let us recognize that monopoly is an economic perversion which can and should be controlled, and that the benefits to society of centralized industry can no more be permanently legislated out of existence than can the use of electricity, to which centralization is largely due.

Let us remember that our people are sovereign in their power, and that sooner or later they settle our questions in favor of what is best for the greatest number. If you men believe that our prosperity lies in centralized industry, justly controlled by true co-operation between government and business, it behooves you to spread the gospel of economic truth and encourage the spirit of co-operation.

Boiler Makers

Will Hold Strictly Business Convention at Erie in June

The 1915 convention of The American Boiler Manufacturers' Association will be held at the Lawrence hotel, Erie, Pa., on June 21, 22 and 23. Boiler manufacturers throughout the United States and Canada are invited to attend.

This convention will be held for business purposes only. No entertainment of any kind will be provided.

Ways and means will be considered for the installing in all states of the uniform boiler code, as drafted by the American Society of Mechanical Engineers with the assistance of a committee representing boiler manufacturers.

Papers pertaining to proper methods of arriving at costs, and a report on a uniform cost system will be made. A report will also be made relative to the activity of the boiler manufacturers' committee in the redrafting of the A. S. M. E. boiler code and getting it adopted at once by several states. Another report will be made on the drafting of a uniform clause pertaining to guarantee on material, workmanship and terms of payment, which will be offered to all boiler manufacturers for use in their standard specifications.

The Erie City Iron Works, also the Union Iron Works Co., have stated that the courtesy of a visit through their plants will be extended to all visiting boiler manufacturers.

Boiler manufacturers contemplating attending this convention are requested to at once write to J. D. Farasey, secretary, East Thirty-seventh street and Erie railroad, Cleveland, in order that committee in charge of convention may know how many to expect.

The firm name of the U. S. Steel Tank & Pipe Co., Chicago, has been changed to the U. S. Blow Pipe & Dust Collecting Co. The new name is more representative of the company's business, which consists of the manufacture of dust-collecting systems.

MEN OF THE IRON TRADE

Who they are **Where they are** **What they are doing**

W. D. Crawford, president of La Belle Iron Works, Steubenville, O., has resigned, effective May 1. R. C. Kirk, secretary and treasurer of the company, has been elected to the presidency and to the directorate to fill the vacancy. Mr. Crawford, who had been vice president and general manager of La Belle company for several years, was elected to the presidency of the concern in January, 1913. Previous to his connection with La Belle company, he had been identified with the Schoenberger works of the American Steel & Wire Co., at Pittsburgh, and is well known in the iron and steel trade. He has made no announcement as to future plans.

R. C. KIRK,
President La Belle Iron Works

Mr. Kirk has been an active member of the iron and steel trade for a score of years, and is well qualified for his new position. He became identified with the steel industry in 1895, when he accepted a position with the Falcon Iron & Nail Co., Niles, O., sheet and skelp manufacturer. He remained with that interest until April 1, 1900, when he went to New York City as chief clerk in the accounting department of the American Sheet Steel Co. which had acquired the property of the Falcon company. In that capacity Mr. Kirk became associated with I. M. Scott, now president of the Wheeling Steel & Iron Co., Wheeling, W. Va., who preceded Mr. Crawford as president of La Belle Iron Works. In December, 1903, Mr. Kirk accepted a position with La Belle company as auditor. A year later he was elected treasurer, and upon the resignation of Mr. Scott was appointed secretary and treasurer. Mr. Crawford will continue to act as a member of the board of directors of La Belle company.

John E. Sullivan, for 10 years general sales manager of the Carpenter Steel Co., Reading, Pa., has resigned. His plans for the future have not yet been announced.

Capt. Waldimir Oranowsky, accompanied by several other Russian officers, has arrived in New York to represent his government in the purchase of arms and ammunition in this country.

Joseph G. Walton, resident manager of the Pittsburgh office of Eaton, Rhodes & Co., Cincinnati, has been succeeded by Thomas R. Heyward Jr., formerly Pittsburgh resident masager for Walter-Wallingford & Co., also of Cincinnati. Mr. Walton now occupies a more important position in the home office of Eaton, Rhodes & Co.

President James A. Farrell, of the United States Steel Corporation, left New York, April 29, for an extended western trip, which will include visits at subsidiary company offices in various cities and will terminate at the Panama Pacific International Exposition, San Francisco. Mr. Farrell will be away from New York for about six weeks.

Merrill G. Baker has been appointed assistant general manager of sales of the American Vanadium Co. Mr. Baker was born in Indiana county, Pa., in 1880, graduated from Dickinson college in 1904 and entered the employ of the Cambria Steel Co. in January, 1905. He won rapid promotion and in September, 1912, was appointed assistant to the general manager of sales, which position he resigned to become assistant general manager of sales of the American Vanadium Co.

N. L. C. Kachelmacker, president and one of the principal stockholders of the Bessie Furnace Co., Columbus, O., operating a blast furnace stack at New Straitsville, O., has retired from the active management of the company. He expects to undergo a serious operation for throat trouble as soon as possible. George S. Davison, Pittsburgh, who is financially interested in the Bessie company, has been elected president, Allen S. Davison, treasurer, and Albert P. Meyer, secretary of the concern. Offices of the company will be moved to Pittsburgh, and the Allen S. Davison Co., Oliver building, that city, will continue to act as sales agents. Mr. Kachelmacher will continue as chairman of the board.

W. D. CRAWFORD,
Ex-President La Belle Iron Works

C. L. Remington, general manager of William McLean & Co., merchants, engineers, manufacturers and importers, with headquarters at Melbourne, Australia, now is making a tour of the industrial centers of the United States, accompanied by H. P. McColl, chief engineer of the McLean company. Mr. Remington and his associates are particularly interested in labor-saving foundry equipment and are anxious to receive catalogs and other printed matter from manufacturers of these devices. During the next two weeks Mr. Remington will make his headquarters at 3219 North Capitol avenue, Indianapolis, Ind. H. P. McColl is located at the Hotel La Salle, Chicago.

MEN OF MACHINERY TRADE

Who they are Where they are What they are doing

Charles E. Carpenter of the Allied Machinery Co. of America, New York, has left for Europe on a business trip.

H. V. Lewis has become associated with the Allied Machinery Co. of America, New York, as European representative.

A. Vuilleumier, chief draftsman of the Becker Milling Machine Co., Hyde Park, Mass., has been made assistant to chief engineer.

James Rushworth has succeeded Arthur Pletz as secretary and general manager of the Aurora Tool Works, Aurora, Ind.

R. Glaenzer, of Glaenzer & Perraud, Paris, sailed for France a few days ago. He had been in this country for several months making purchases of machine tools.

Paul B. Liebermann, formerly assistant chief engineer of the Sprague Electric Co., has become associated with the Hyatt Roller Bearing Co. as engineer of tests.

W. C. Chapman, for several years with the sales force of the Philadelphia office of Manning, Maxwell & Moore, Inc., has been appointed manager of the Philadelphia branch.

B. F. Stowell, for the past nine years master mechanic of the Hendee Motorcycle Co., is now with the Van Norman Machine Tool Co., Springfield, Mass., as mechanical engineer.

E. W. Dodge, for the past 25 years with the Norton Co., Worcester, Mass., the last six years as sales manager, has resigned to join the Waltham Emery Wheel Co. as sales manager.

E. Goutard, who has been in this country since last November making large purchases of machine tools in the interest of the Schneider Gun Works, Creusot, France, has returned to France.

A. L. Lewis has resigned as general manager of the Cowan Truck Co., Holyoke, Mass., and has organized the Lewis-Shepard Co., Boston, to manufacture a new design of elevating truck.

Carlton R. Mabley, for the last five years general manager of the R. I. V. Ball Bearing Co., has joined the selling organization of the S. K. F. Ball Bearing Co., 50 Church street, New York City.

Charles E. Mack has been appointed general manager of the John H. Wood Iron Works, Portland, Ore., engineer, founder and machinist. Mr. Mack succeeds John Wood, late president of this company.

D. J. Normoyle has been made manager of the Philadelphia office of the Niles-Bement-Pond Co., Inc. Mr. Normoyle also will continue in charge of the Pratt & Whitney Co.'s sales in Philadelphia territory, as formerly.

John H. Hall, 2 Rector street, New York City, has discontinued his practice as consulting engineer, and on May 1 became associated with the Taylor-Wharton Iron & Steel Co., High Bridge, N. J., as metallurgical engineer.

Frederick Ray has recently opened an office at 50 Church street, New York, as consulting engineer, where he will make a specialty of centrifugal pumping machinery, condensing equipment, cooling towers and similar apparatus.

Walter M. Wood, manager of the Boston branch of Manning, Maxwell & Moore, Inc., has resigned on account of ill health, after 15 years' service. J. S. Wainwright, formerly of the Detroit branch, has been appointed manager at Boston.

Carl D. Wilder, for the past four years chief tool designer of the Norton Grinding Co., Worcester, Mass., has opened an office at 26 Brittan Lane, Worcester, as a tool and production engineer for designing tools and standardizing output.

R. S. Lord, vice president Hope Engineering & Supply Co., Pittsburgh, will talk on "Pipe Couplings" June 1 before the mechanical section of the Engineers' Society of Western Pennsylvania. The meeting will be held in the society rooms, Oliver building, Pittsburgh.

Fred A. Geier, president of the Cincinnati Milling Machine Co., Cincinnati, has purchased the interest of Larz Anderson in the Cincinnati Shaper Co. and the Cincinnati Gear Cutting Machine Co., Cincinnati. P. G. March will continue as president. The business will be extended.

A. L. Whittemore, formerly with J. H. Williams & Co., Brooklyn, N. Y., has opened an office as manufacturers' representative, 40 South Clinton street, Chicago. He represents the Vilchek Tool Co., Cleveland, manufacturer of hardware, tools and automobile tool kits; W. N. Best, New York, manufacturer of fuel oil burners and furnaces, and the Grinden Art Metal Co., Brooklyn, N. Y.

R. E. Ellis, formerly associated with the Steinle Turret Machine Co., Madison, Wis., has formed the R. E. Ellis Engineering Co., with offices in the First National Bank building, Chicago. He will represent the Bury Compressor Co. and the Standard Electric Tool Co. in that district.

E. R. Miner, for more than two years advertising manager of the Baird Machine Co., Bridgeport, Conn., builder of wire-working and special machinery, has resigned to become an advertising specialist with office at 125 East Twenty-third street, New York City. He will give his principal attention to mechanical lines.

C. H. Johnson, of the Gisholt Machine Co., Madison, Wis., sailed recently on the steamship Christianiafjord for Russia. Mr. Johnson formerly was the European manager of the Gisholt Machine Co., with headquarters in Berlin. He left Germany shortly after the outbreak of the war and since then had been in this country.

Arthur C. Pletz has resigned his position as secretary and general manager of the Aurora Tool Works, Aurora, Ind., but retains his financial interest in the concern. Mr. Pletz will manufacture a line of machine tool specialties, and design, develop and build special machinery and tools. He is located at 910 Commercial Tribune building, Cincinnati.

Dr. John A. Brashear, president of the American Society of Mechanical Engineers, has completed a lecture tour in the east. He left Pittsburgh, his home city, April 27. On the following day he addressed the Allied Engineering Societies of Providence, R. I. On April 28 he talked to students at Brown University and he spent the week-end at West Point, where he spoke on "Astronomical Instruments and Astronomy" to the cadets. Dr. Brashear has talked to students at the United States Military Academy for six consecutive years. On Monday, May 3, he delivered an address at the University of Pennsylvania, and he was one of the principal speakers at the fiftieth anniversary of Worcester Polytechnic Institute.

News of Employers and Employes

Indicted Chicago Contractors, Members of So-Called Trust, Will Turn State's Evidence

Chicago, May 3.—Indictments of about 100 labor union officials and contractors for interfering with interstate commerce and conspiracy, as noted in *The Iron Trade Review* April 29, has been followed by the announcement that States Attorney Maclay Hoyne, of Cook county, will make use of the information gathered by the federal grand jury to determine if state laws have been violated. If so, further indictments may be expected in the state courts on charges which were not within the jurisdiction of the federal court.

Another feature following the announcement of indictments is the determination of a number of contractors, members of the so-called trust, to turn state's evidence, and several belonging to these organizations, of which they were unwilling members, claim they joined the organizations in order to be able to do business without molestation.

The indictments were eight in number as follows:

Indictment No. 1 results from a restraint of interstate commerce through interference with a shipment of boilers from S. Freeman & Sons Mfg. Co., Racine, Wis., to Viviano Bros. Macaroni Co., Chicago.

Indictment No. 2 charges conspiracy to interfere with several carload shipments of ice machinery from York, Pa., to the McAvoy Brewing Co., Chicago. The charge here is that union agents prevented unloading the machinery from cars.

Indictment No. 3 charges conspiracy to interfere with shipments of steel pipe from Hartford, Conn., and steel tanks from Canton, O., to the Ravenswood Ice Co. The charge here is that unloading was prevented and a threat was made to call a strike if the materials were moved.

Indictment No. 4 charges interference with a shipment of ice-making machinery from York, Pa., to the Chicago Consolidated Brewing & Malting Co. In this case the charge is interfering with unloading and destruction of machinery after unloading had been commenced.

Indictment No. 5 charges interference with the shipment of machinery from the Ice & Cold Machine Co., of St. Louis, to the Lincoln Ice Co., Chicago.

Indictment No. 6 charges interference with a shipment of machinery from Jersey City, N. J., to the Knickerbocker Ice Co., Chicago.

Indictment No. 7 charges that business agents of electricians' unions conspired with the Chicago Switchboard Manufacturers' Association to prevent goods from outside cities being brought here to be placed by union men. The charge here is maintaining a combine in restraint of trade and entering into a contract to carry out this purpose in violation of the Sherman law.

Indictment No. 8 charges union officials and contractors forming the Chicago Lighting Fixture Association with naming and fixing the prices on fixtures, preventing installation of fixtures unless handled by members of the association and members of the union. Union officials are charged with enforcing the rules adopted by the employers for the maintenance of the alleged monopoly.

Building Trades Strike

Chicago, May 3.—Building trades were practically completely tied up May 1 in this city. Structural iron workers went on strike the evening of April 30, which completed the tie-up begun when carpenters left their jobs a fortnight before. The strike by structural iron workers, it is believed, will be more difficult to settle than that of the carpenters, because it involves a question of jurisdiction. This comes about in the demand by structural iron workers that their members be given the work of placing steel reinforcement in concrete work instead of it being done as now by laborers at 40 cents per hour. The iron workers are asking an increase in wages from 68 to 70 cents per hour for the first year, 72½ for the second year and 75 cents for the third year of the life of the agreement.

The situation in the building trades now is that carpenters, painters, lathers, structural iron workers and mill men, a total of about 33,000, are on strike, sheet metal workers numbering 1,100 are locked out and other workers numbering about 38,000 have signed the uniform agreement, but for the most part are unable to work because of other unions being on strike.

The present situation rests on an inability to come to an agreement on three points. These are whether the proposed agreement shall specifically provide for the free use of "outside materials"; whether it shall expire April 15 or May 31, 1918, and what shall be the basis of wage adjustments. Carpenters wish nothing said about materials while contractors insist on retaining that provision and cite recent indictments by the federal grand jury as a justification for their attitude.

The strike by structural iron workers has interfered with construction of a number of public projects, including four important bridges in Chicago, a waterworks crib and the new recreation pier, as well as a great deal of railroad work and commercial construction.

Award of Arbitrators

Chicago, May 3.—An award by the arbitration board which has been hearing evidence following the demand of 65,000 enginemen employed by western railroads for increased wages and changes in working conditions was made April 30 at Chicago.

The decisions, following five months' consideration, resulted in a split and the two brotherhood representatives filed a dissenting opinion which states that nothing is settled but simply is postponed for a period of 12 months. They aver a great opportunity has been lost for bringing about industrial peace and co-operation of employes and employers.

A feature of the board's consideration of matters is a strong protest made by W. S. Stone, grand chief engineer of the Brotherhood of Locomotive Engineers and W. S. Carter, president of the Brotherhood of Locomotive Firemen and Enginemen, who represented these bodies before the arbitration board. This protest was aimed at Charles Nagel, former secretary of commerce and labor, who, they claim, is affiliated with interests which have investments in railway stocks and is declared unfriendly to organized labor. The protests were made to President Wilson, to Judge Walter E. Knapp and W. L. Chambers of the federal board of mediation and conciliation at Washington. They were asked by President Wilson and the other federal officials to withdraw their opposition and let the award go forward. The protest, however, was filed before the arbitration commission and stands as part of the record.

The award is disappointing to rail-

News of Employers and Employes

Ohio Foundrymen Ask Appropriation of $200,000 to Prevent Accidents —Arbitrator Nagel Makes Statement

road men because the total increase in wages, they claim, will not reach more than $1,000,000 a year, which is ridiculously small, according to their ideas, when divided among 65,000 workers. Railroad officials insist the increase will be much more, stating that payrolls will be swelled at least $5,000,000 annually by these concessions.

Wage increases as allowed by the board are as follows: Overtime increase in passenger service to 75 cents per hour for engineers and 45 cents for firemen, an increase of 10 to 15 per cent; engineers and firemen on local or way freights to be paid a 10 per cent increase over through freight rates; enginemen on pushers, helpers and other unclassified service to be paid on the basis of through freight rates, an increase of 10 to 15 per cent; enginemen on switch engines to receive 15 cents to 25 cents a day increase; an advance on through freight service averaging 40 cents per 100 miles.

Hour and service allowances are as follows: Passenger service employes' day to be computed on the basis of 100 miles or less, five hours or less, all mileage over 100 miles pro rata; 100 miles or less, 10 hours or less, to constitute other days except in switching service; employes to be paid for "terminal delays," time beginning when they are called to leave roundhouse; when held at other than "home terminal" more than 22 hours, 10 hours pay for each 24 hours held; engineers and firemen to have right to position of motorman and helper whenever electric, multiple unit, gasoline or other service is installed; switching service day 10 hours with time and one-half for overtime and 30 minutes for meals after six consecutive hours; efficiency tests to be conducted so as not to be hazardous; firemen to be relieved of cleaning locomotive, throwing switches and like service.

The award does not allow an increase to be paid engineers and firemen based upon classification of engines. This was the big increase asked for.

The award was filed with the clerk of the United States district court in this city and was signed by Federal Judge J. C. Pritchard, Charles Nagel, H. E. Byram, vice president of the Chicago, Burlington & Quincy Railroad, and W. L. Park, vice president of the Illinois Central Railroad. The first two were neutral members and the last two represented railroads. F. A. Burgess, assistant grand chief of the Brotherhood of Locomotive Engineers, and Timothy Shea, who is assistant president of the Brotherhood of Locomotive Firemen and Enginemen, were labor representatives on the board, who declined to sign the award and filed the dissenting opinion.

Mr. Nagel has issued a statement in which he admits the charges of his connection with various enterprises, but claims that the brotherhood men had been told of these facts, that they were a matter of public knowledge, that these connections in no wise had any influence on him and that he did his duty as he saw it. He also states that he was drafted to serve on the arbitration board and had no way to avoid serving.

Features of Railroad Award

Men asked advances totaling $41,000,000.

Board granted advances not exceeding $5,000,000.

Men accept decision for one year.

Protest by brotherhood officials that Charles S. Nagel, member of board, former secretary of Commerce and Labor, has railroad affiliations preventing his being neutral.

Dissenting opinion by brotherhood representatives on arbitration board says award is not settlement but merely postponement for 12 months during which it is binding.

Adopt Safety Rules

A meeting of the special committee and sub-committees on foundry regulations, which were appointed some time ago by the State Industrial Commission of Ohio, was held at the Hotel Gibson, Cincinnati, April 30. Victor T. Noonan, director of safety for the industrial commission, presided at the sessions, which were attended by foundrymen and representatives of iron molders' unions from all parts of the state.

The principal business transacted was the unanimous adoption of a resolution to ask the Ohio legislature to appropriate $100,000 this year and the same amount next year, to be used in an educational campaign by the state industrial commission of Ohio, in an effort to lessen accidents among workmen in the state. The motion was made by John E. Galvin, vice president of the Ohio Steel Foundry Co., Lima, O.

Forty-eight of the 98 regulations proposed by Mr. West's committee to guard against accidents to foundry employes were adopted. Chief among these are that women coremakers will not be required to lift more than 15 pounds of material, nor handle cores hotter than 110 degrees, and that rooms be so arranged that gas fumes from core ovens cannot enter where women are employed.

A number of the proposed rules were taken from those which had been compiled under the supervision of the industrial board of New York state by foundrymen of that state appointed to do the work. A few of the New York rules were amended at Cincinnati to embody features found in the Ohio's committee proposals and to also make them better adaptable for general conditions. The Ohio rules which had reference to the construction of foundries and operation of cranes were set aside to be handed over to the committees which are to compile rules for governing construction work and operation of power and machinery in Ohio with the request that all the original features found in the Ohio foundrymen's proposals on these points be embodied as far as practical in the other committee's rulings.

A number of the safety proposals embodied in the proposed 98 rules or regulations were not adopted to become laws on account of their advisory nature, but were recommended for the consideration of the industrial commissioners with the solicitation that they should be printed and accompany the laws as advisory measures to govern foundrymen in complying with the industrial commissioners' aims to attain the highest efficiency in all that pertains to safeguarding foundry employes.

Two new members, Henry Ritter, superintendent of the Lunkenheimer Co., Cincinnati, and Walter Geier, of the Modern Foundry Co., Cincinnati, were added to the committee which is now as follows: John O'Neil, Columbus; Fred L. Baumgartner, Cleveland; J. F. Sords, Cleveland; Timothy Rowan, Hamilton; Thomas D. West, Cleveland; J. D. Leary, Cincinnati; J.

B. Oberhelman, Cincinnati; H. J. Bogis, Cleveland; Henry Titer, Springfield; J. E. Galvin, Lima; Thomas McDonald, Dayton; Peter Curley, Cleveland; G. H. Thompson, Columbus; Henry Ritter, Cincinnati and Walter Geier, Cincinnati. The next meeting of the committee will be held at Springfield, O., May 21, when further consideration will be given more of the rules proposed by Mr. West's committee.

BENJAMIN J. WALKER

Death of Benj. J. Walker

Death claimed Benjamin J. Walker, vice president of the Erie Malleable Iron Co., Erie, Pa., in St. Luke's hospital, San Francisco, on the afternoon of Thursday, April 29.

With this passing away the industry with which he was connected lost one of its most brilliant and indefatigable workers. No one ever connected with it so unceasingly dedicated his every energy and atom of strength to the refining of all of the processes and improvements that entered into the manufacture of the material made at the plant with which he was connected.

He was just 59 years old. Having served his apprenticeship as an iron molder in the plant of the Dayton Malleable Iron Co., at Dayton, O., he later worked in the foundry of the Jarecki Mfg. Co., Erie, Pa., and when the Erie Malleable Iron Co., was established some 35 years ago, he went to work there as an iron molder. Five years later, the ability which finally made him so conspicuous began to assert itself and he was made superintendent, which position he held for many years until the appointment to that office of his son, E. E. Walker, when Mr. Walker became vice president.

He was devoted always to every form of metallurgical research work and gave himself the needed education to enable him to master the many complicated problems connected with it. He never allowed any proposition to go unsolved and was never satisfied or happy unless busy with some new development.

He had been in poor health for some years, but contrary to the desire of his associates, continued to give his close attention to business. Finally he left for a trip to Japan, but was overtaken by his last illness en route.

Aside from his knowledge of the subject and his skill as a manufacturer of malleable iron, he was conspicuous for possessing a most delightful personality that was of itself sufficient to compel the admiration of an extensive circle of friends, many of whom, especially those connected with his own industry, constantly made Erie the Mecca for frequent visits in order to talk over the problems confronting them. He was always glad to show, explain and discuss anything connected with the business and was a great believer in the advantage to be gained by collaboration in every way with his fellow manufacturers. The doors of the Erie Malleable Iron Co., and everything connected therewith were always open to visitors and all were cordially welcomed.

Obituaries

Edward A. Hill, a retired manufacturer of railway supplies, died April 29, at Chicago, aged 70.

Winfield Scott Clow, aged 74 years, died recently at Pittsburgh, where he had lived the greater part of his life. He formerly was connected with the Pittsburgh Forge & Iron Co., but removed to Peru, Ill., about 10 years ago to become secretary of the Illinois Zinc Co.

Thomas Anderson, identified with the Jones & Laughlin Steel Co., Pittsburgh, for a score of years, died at the West Penn hospital, that city, April 27, from intestinal trouble. He had been identified with the steel trade in the Pittsburgh district practically all his life, and was well known in all branches of the industry. Mr. Anderson was born in Belfast, Ireland, May 22, 1874, and accompanied his parents to the Pittsburgh district when a boy. For several years he was employed by the Oliver Iron & Steel Co. and also was connected with the Carnegie Steel Co. before accepting a position in the order department of the Jones & Laughlin company. Mr. Anderson was appointed head of the order department in 1910 and had been acting until recently as special representative of the company.

Business News of Nation's Capital

Attorney Ellis Makes Strong Argument in Favor of Federal Trade Commission Giving Opinions as to Legality of Acts

Washington, May 4.—That congress, President Wilson and the country expected the federal trade commission, not only to co-operate with business in adjusting large affairs of interstate commerce to law, but to also consult and advise with them to avoid the endless lawsuits which had been the result of anti-trust statutes, is asserted in a memorandum filed with the commission by Wade E. Ellis. Mr. Ellis, a prominent attorney of this city, was assistant to the attorney general under President Taft. His memorandum makes a concise, strong argument in support of the claims of business interests generally that they should be told in advance what is and what is not unlawful. The name of his client is not announced. Should the commission see fit to act affirmatively upon the points made by Mr. Ellis, it would answer such queries as those recently incorporated in an interesting letter written to *The Iron Trade Review*, by Charles S. Powell, Cleveland, of the Factory Appliance Co., dealing with unsatisfactory conditions characterizing foreign business. Mr. Powell suggested a plan of organization among manufacturers of war materials to relieve the situation, but indicated that the Sherman anti-trust law might interfere.

In his memorandum Mr. Ellis says a strict construction of the Clayton and federal trade acts may not in specific terms require the commission to make investigations and orders for the guidance of business men in advance, but whatever the requirement of the law may be, it is clear that there is nothing in the language of the statutes inconsistent with the exercise of the power suggested.

"It is clear beyond all doubt," Mr. Ellis says, "that the federal commission may, in the exercise of its discretion, under the authority to investigate and make rules and regulations, consider proposed plans for the adjustment of relations between corporations engaged in interstate commerce and make administrative rulings based on the facts ascertained, which will be useful for the guidance of such corporations and all others whose situation may be similar. This is in conformity with the powers now exercised by the interstate commerce commission where no greater or different ground of authority appears; it is consistent with the attitude of the federal reserve board; and more than all else it responds fairly to the purpose of the statute, the expectations of the country, and a good, wholesome public policy."

The power to determine or express an opinion in advance as to the legality of a proposed action, it is pointed out, is to be found in general provisions of the federal trade act, especially in the authority of the commission to investigate the organization, business and conduct of any corporation in its relation to other corporations, and to make rules and regulations for the purpose of carrying out the provisions of the act.

"Under such general powers", it is asserted, "it may be said that the commission has authority to investigate and reach a conclusion as to the legality of the proposed action of a corporation in advance of such action."

This, Mr. Ellis contends, would seem to be the correct determination of the commission's power, one reason cited being that consideration of the causes of the enactment and the evils sought to be remedied by the act proved this. Thereupon he refers to a recommendation by Attorney General Knox in 1903; the annual report of the bureau of corporations, 1914; the report of the senate committee on the original bill; the message of President Wilson, Jan. 20, 1914, and the report of the senate committee which approved the bill as finally enacted. Secondly, it is stated that the interstate commerce commission, which has authority to inquire into the management and business of certain corporations and to make rules and regulations to carry out the provisions of the interstate commerce act has in many instances exercised the power of determining questions of the violation of the act in advance. It is further declared that the federal reserve board which is charged with the enforcement of the Clayton act in so far as it relates to banks has exercised and proposes to exercise power to make rulings interpreting the law for the guidance of banks in the future and in advance of any specific violations.

Policy of National Committee

Washington, May 4.—According to an expression in a letter received by the federal trade commission from H. A. Wheeler, chairman of the federal trade committee of the Chamber of Commerce of the United States, there will be absolute co-operation by the commercial interests of the country with the commission.

"We are convinced," says the letter, in part, "that with the coming of the federal trade commission we have the opportunity of proving not only that co-operation can exist, but that it should exist, and will make possible highly constructive measures in behalf of the interests to be regulated, while at the same time affording the general public every possible protection; in a word, a commission whose work may be affirmative rather than negative.

"It is in this belief that our committee offers its service to your commission, and in so doing we beg to assure you:

"That we claim no right to your consideration not shared by every national interest which we are charged to supervise or protect;

"That we shall be particularly careful not to intrude our views unasked, except where we believe the subject to be of vital importance.

"We shall be happy to act as a medium between your commission and the interests we represent wherever you may believe we can be helpful.

"No service called for will impose even the remotest obligation on the commission.

"It is our hope that the same frank informality which has characterized our first conference will persist in all of the relations which we may have in days to come."

The Stafford Iron Works, Inc., Worcester, Mass., has been organized with a capital stock of $50,000 to carry on the manufacture of ornamental iron and general foundry work. A new foundry plant is to be erected in Worcester. The officers of the company are Chas. F. Davis, New York City, formerly of Worcester; treasurer, Matthias B. Walls, New York; general manager, G. Stanley Walls, Worcester.

Money and Iron: Fact and Comment

Industrial Stocks Advance—Reports of Orders for War Equipment Have Stimulating Effect

Nearly all industrial stocks made gains last week, but a noteworthy exception was the Bethlehem Steel Co., which, after having advanced in a sensational manner in preceding weeks, lost 4 points. American Locomotive, which also had been making sensational advances, scored only ¼ of a point.

Monday, motor shares were strong and copper made fair gains; steel was heavily sold. On the whole, there was a rather irregular closing. The quarterly report of the United States Steel Corporation was not made public until after the closing of the market Tuesday. It was received with considerable satisfaction on account of the gain in earnings made since the first of the year. Steel common was active and strong Tuesday in a market which was otherwise pretty weak. Announcements Thursday by J. P. Morgan & Co. that the New York Central's $100,000,000 debenture convertible bond issue was a success had a stimulating effect on the market. Another favorable development was the over-subscription of the Baltimore & Ohio's $40,000,000, 3-year, 4½ per cent note issue. Encouraged by the Steel Corporation report, the bulls operated with some success Wednesday. The market activity broadened Thursday and nearly all stocks advanced somewhat. Pressed Steel Car made the largest gain, recording 5¼ points net advance. Steel common rose to above 60 for the second time in the past few weeks.

Announcement of additional orders for shells sent some stocks upward Friday. Westinghouse rose 10 points and closed with a net gain of 8; Baldwin Locomotive advanced 4½. Activity in Steel continued Saturday. The unconfirmed report of a tremendous order for steel rails was a factor in the situation. Changes in leading stocks closely identified with the iron and steel business are shown in the following table:

American Brake Shoe & Fdy. Co....	+ 3⅛
Amer. Brake Shoe & Fdy. Co., prfd.	+ 7½
American Can	+ 2
American Can, prfd.....	+ 2
American Car & Foundry Co.....	+ 2
Amer. Car & Fdy. Co., prfd.....	+ 1⅛
American Locomotive	+ ¼
American Locomotive, prfd.....	+ 2
American Steel Foundries.....	+ 5¼
Baldwin Locomotive	+ 5¼
Baldwin Locomotive, prfd.....	+ ¼
Bethlehem Steel	— 4
Bethlehem Steel, prfd.....	+ ⅞
Colorado Fuel & Iron.....	+ ⅜
Continental Can	+ 2⅝
Continental Can, prfd.....	+ 1½
General Electric.....	+ 6⅞
International Harvester of N. J.....	— 3¼
International Harvester Corp.....	.....
Inter. Harv. Corp., prfd.....	.....
Nat'l. Enameling & Stamping Co....	+ 1½
Nat'l. Enameling & Stamping Co., prfd.	
Pressed Steel Car.....	+ 7⅞
Pressed Steel Car, prfd.....	+ 2
Pullman Palace Car.....	+ 4¼
Republic Iron & Steel.....	+ 1½
Republic Iron & Steel, prfd.....	+ 2⅜
U. S. Cast Iron Pipe & Fdy.....	+ 1⅛
U. S. Cast Iron Pipe & Fdy., prfd..	+ 1⅛
United States Steel.....	+ ⅜
United States Steel, prfd.....	+ ⅝
Westinghouse Mfg.....	+ 16⅞

Allis-Chalmers's Report

The Allis-Chalmers Mfg. Co. made total sales of $10,323,150 in 1914, as compared with $11,127,621 in the eight and one-half months ended Dec. 31, 1913. Operations and selling costs absorbed more than $10,500,000, so that the year's result from manufacturing was a loss of $277,709, as compared with a surplus of $606,596 in the preceding period. Income from other sources amounted to $252,641, and the final result was a deficit of $25,068 against a surplus of $755,124 in 1913. The report says that after rigid economies were enforced after August, manufacturing costs were reduced to the lowest basis in the company's history. The income account for the year ended Dec. 31, 1914, compares with the eight and one-half months ended Dec. 31, 1913, as follows:

	Yr. ended Dec. 31, '14.	Ap. 16 to Dec. 31, '13.
Sales billed	$10,323,150	$11,127,621
Cost, inc. dep. & dev.	9,221,174	9,503,472
Factory profit	$1,101,976	$1,624,149
Gen. and sell exp.....	1,379,685	1,017,553
Net mfg. profit.....	$*277,709	$ 606,596
Other income	252,640	148,529
Net profit	$ 25,008	$ 755,125

*Loss.

Unfilled orders Dec. 31, 1914, were $2,503,936, comparing with $3,358,684 the previous year. The annual meeting of the company will be held May 6.

In his statement to shareholders President Otto H. Falk says that the decline in the volume of business, which began in August, 1913, continued during the early part of 1914 and became more pronounced on the breaking out of the European war.

Notwithstanding the decreased operations, the full charges for reserves and depreciation have been maintained and included in operating expenses. The expenditure of $477,495 for maintenance repairs and upkeep has kept all the plants and equipment in good condition. In addition the sum of $381,380 for general depreciation of the property was charged to the operating expenses of the year.

The general balance sheet compares as follows:

ASSETS.

Real estate, plant.....	$10,206,028	$11,366,271
Other real estate.....	802,452	915,304
Patents	19,615,804	19,761,731
†Voting trust cert.....	406,135	406,135
Notes and accts. recv.	3,445,624	4,972,468
Inventories	4,149,243	4,889,171
Mark securities	3,881,851	2,102,088
Cash	776,734	1,274,424
Unexpired insurance...	13,175	22,125
Bullock elec. bonds...	849,015	.....
Totals	$44,146,064	$45,709,717

†Held in escrow under option agreement for sale to Otto H. Falk and associates.

LIABILITIES.

Preferred stock	$16,500,000	$16,500,000
Common stock	26,000,000	26,000,000
Stock Bul. Elec. Co..	.....	1,170,000
Accts. payable	210,508	319,003
Complet. contrs.	248,833	407,137
Pay roll. accrued.....	177,513	173,195
Taxes, accrued	121,509	143,166
Reserves	157,643	241,491
Profit and loss.....	730,056	755,125
Totals	$44,146,064	$45,709,717

Financial Notes

The McIntyre Automobile Co., Auburn, Ind., has filed a bankruptcy petition in the federal court at Ft. Wayne, Ind., giving liabilities at $184,940, and assets at $5,015.

The plant of the new Columbus Buggy Co., Columbus, O., including the part for the manufacture of automobile parts, will be sold at public auction May 12 and 13. The company is in the hands of a receiver, and the property is valued at $300,000.

In common with other manufacturers of farm machinery, the Hart-Parr Co., Charles City, Ia., reports a loss in earnings for the fiscal year ended Jan. 2, 1915. In the absence of an income account the only indication as to the amount of the loss is a decrease of $223,662 in the surplus account. President C. W. Hart explains the loss was due to the high proportionate expense of making sales and to general expenses during light operation of the works. Bills payable have been increased, but the contingent liability on customers' notes sold is decreased an equal amount.

Hill Properties

Report Shows Shipments Made by Steel Corporation Subsidiary

The eighth annual report of the trustees of the Great Northern Iron Ore Properties, including mines formerly held under lease by the Steel Corporation which ended at the close of the year 1914, shows that under the operations of the lease 26,573,808 tons of ore were shipped and that the total receipts from the Great Western Mining Co., (a Steel Corporation subsidiary) were $45,174,225.30. The following table shows the shipments during the period of the lease, the average iron content and the average royalty:

Year.	Tons shipped.	Iron content.	Average royalty.
1907	137,270	58.7641	$0.838726
1908	508	65.1498	1.180295
1909	41,624	56.4001	.792687
1910	2,046,970	56.9633	.853830
1910	106,007	49.00	.30
1911	5,344,078	58.2148	.945308
1911	155,681	49.00	.30
1912	7,435,051	58.3212	1.186650
1912	55,458	49.00	.50
1913	5,221,987	59.6211	1.283936
1913	14,903	49.00	.50
1914	6,008,074	58.8038	1.284627
1914	6,197	49.00	.50
	26,235,562	58.5622	1.150878
	338,246	49.00	.345268

Shipments and receipts under so-called old leases, 1907 to 1914, both inclusive, were 19,002,131 tons of a value of $2,968,126. The shipments and receipts for 1914 out of these old leases were: Mahoning, 1,212,287 tons, $181,843.10; Stevenson, 89,899 tons, $17,979.77; Leetonia, 275,619 tons, $99,222.96; Utica, 247,714 tons, $37,157.06; total, 1,825,519 tons, $336,202.89.

Last Year's Receipts

The receipts of the trustees of the Great Northern Ore Properties for 1914, of which the principal amount was $758,790 from proprietary companies, amounted to $877,959. The distribution to holders of certificates at 50 cents per share amounted to $750,000, and the total disbursements were $822,042.

Some details are given in regard to the contract with the Dean Iron Co., owned by the Tod-Stambaugh Co., Cleveland, the Wysox Iron Co. and others for the operation by the Dean company of the Dean, Itasca and Eddy mines. The Dean mine is a leasehold of the first class carrying an underlying royalty of 25 cents per ton. It contains 8,691,671 tons of iron ore, as estimated by the Minnesota tax commission. The Itasca mine contains 1,469,372 tons of iron ore and the Eddy 5,490,464 tons, as estimated by the same authority.

Under the contract referred to, the Arthur company will receive $1 per ton royalty for all ore shipped from the Dean mine, with minimum requirements as follows:

For the year	Tons.
1915	150,000
1916	250,000
1917, 18, 19, 20, each	300,000
1921	500,000
1922	600,000
1923	700,000
1924, 25, each	600,000
1926, 27, 28, each	900,000
1929	600,000
1930	300,000
1931	100,000

The Dean Iron Co. will repay expenses amounting to $816,006.79 incurred in the stripping of the Dean and Itasca properties, with interest at 6 per cent per annum, from Sept. 1, 1914, by payment at the rate of 15 cents per ton on shipments from these two mines, and will also repay the sum of $350,000, being the amount of advance royalties paid on account of the Eddy mine leasehold, as follows: $17,500 on or before April 30, 1917; $35,000 on or before April 30 in each of the years 1918 to 1925, inclusive; $52,500 on or before April 30, 1926.

The Dean company will, in addition to the foregoing, pay 25 cents per ton on shipments from the Itasca mine until an aggregate of $200,000 shall have been so paid, being the amount of advance royalties paid on the leasehold covering the property. At the rate of production required from this mine, the payment of this amount will be completed during the year 1918.

The report states that during the year a very advantageous arrangement was made with the Oliver Iron Mining Co., the operating company of the Steel Corporation's Great Western Mining Co., whereby the railway tracks, boiler and engine houses and considerable other equipment of surrendered mines were purchased at a price which will not be a burden to the tonnage left in the mines. By this arrangement, the properties were taken over equipped for immediate operation and the shaft mines are all in full operation with good results. The open pit mines will be worked during the shipping season.

Stripping is still in progress at the Dunwoody, from which 5,800,000 yards are to be removed by Oct. 1, 1915, making about 8,000,000 tons of steam shovel ore available. The Dean-Itasca mine is entirely stripped. The Smith mine is also entirely stripped and contains about 700,000 tons of ore. At the Hill Annex mine, the sinking of the shaft has been completed and the contract was let last June to strip about 8,500,000 yards of surface material. This will make available about 4,300,000 tons of ore, some of which can be produced in 1916. A concentrating plant will be erected at Pinacie lake, just south of the Hill Annex mine, where the sandy ore from that and other mines will be treated.

At the termination of the Great Western lease, the following properties were turned over by the Steel Corporation to the trustees: North Star, Fay, Mace, North Uno, South Uno, Mississippi, Leonard and Harold.

New Linde Plant

The Linde Air Products Co., St. Louis, has purchased a factory site on Forest Park boulevard, and the work of erecting the buildings will be started as soon as plans can be drawn and contracts awarded.

The St. Louis plant will be the fourteenth erected by this company, and is in keeping with its policy of adding oxygen producing centers as soon as the demand for the gas is developed in any particular territory.

With the completion of the St. Louis plant, Linde oxygen will be distributed from 39 points, located in the largest industrial centers of this country.

In addition to oxygen, the Linde Air Products Co. produces nitrogen and other rarer gases contained in the atmosphere.

Railroad Building in Canada

Toronto, May 4.—J. D. McArthur, president of the Edmonton, Dunvegan & British Columbia, the Alberta & Great Waterways, and the Central Canada railway companies, announces an extensive construction program north of Edmonton, Alta., during the coming season, employing from 5,000 to 6,000 men. The Edmonton, Dunvegan & British Columbia line which has recently obtained a guarantee from the Alberta government, will be extended from the end of steel at Big Smoky River for 67 miles west. The Grande Prairie branch of this line, 60 miles long, will be located and partly graded this season. Work on the Central Canada branch, on which 21 miles of steel are already laid, will be continued for the remaining 29 miles to Peace River Crossing with the aid of a loan from the provincial government. Grading on the Alberta & Great Waterways will be completed to Fort McMurray as rapidly as possible and the laying of steel proceeded with. The total distance to Fort McMurray is 300 miles, on 135 miles of which the steel has been laid. Mr. McArthur states that last year's expenditure of about $2,000,000 in wages will be considerably exceeded by the outlay during this year.

Threats Do Not Stop War Orders

Export Demand for Machine Tools Larger Than Ever—Suit Against Allis-Chalmers Probably Will Have No Effect—Railroads Waking Up

EXPORT demand for machine tools, after a lull, has again assumed such tremendous proportions that a number of large concerns say they never before have seen anything like it in their history. These export orders involve chiefly engine lathes and screw machines and knee type milling machines, although certain other lines of machine tools, such as planers, and boring mills, which have been moving very slowly, now are called for more actively. By far the largest part of this buying comes from Russia and England, principally from the former country. Good orders are coming also from other countries in Europe. In the domestic market, there continues to be a good demand for machine tools by concerns who are active in turning out war supplies. A large part of the buying during the last few days has been done by concerns previously mentioned as buyers of machine tools for war purposes. Among new buyers, the most important was the Tredegar Iron Works, Richmond, Va., which made heavy purchases of equipment for turning out projectiles. It is understood this apparatus will be used for manufacturing projectiles for the United States government.

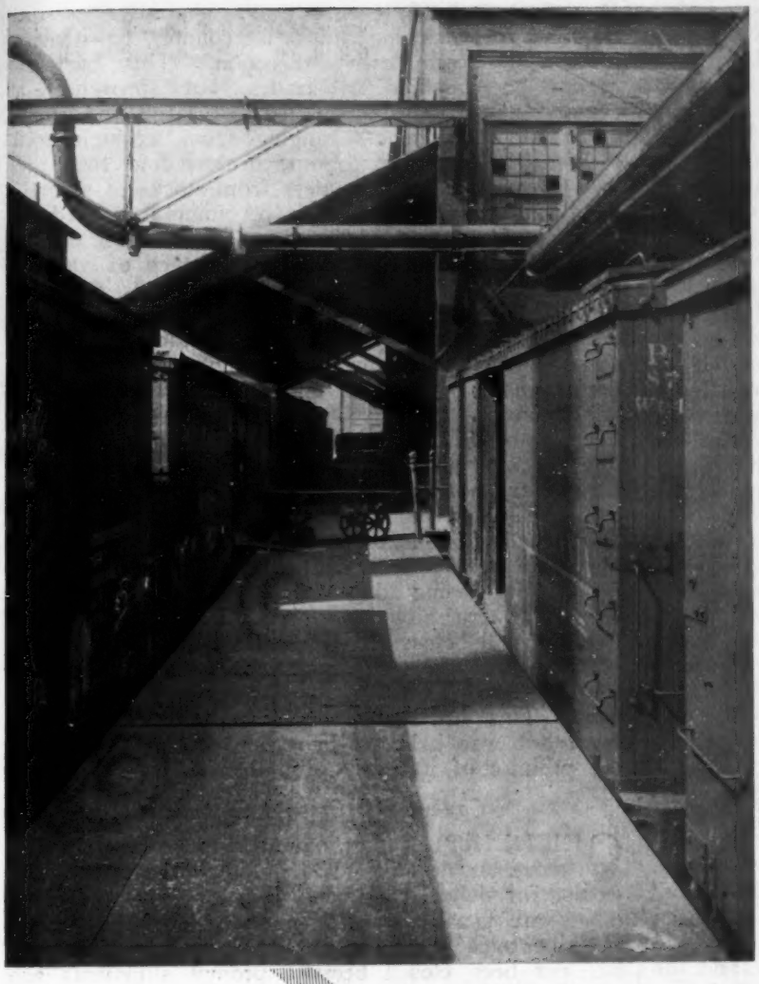
A development of interest is the announcement by the Crucible Steel Co. of America that it will greatly increase the capacity of its Atha plant at Harrison, N. J.; in fact, the contracts for three large new buildings, involving more than 4,000 tons of structural steel, already have been awarded. One of the new buildings will be an addition to the power plant and the other two extensions to the machine shop. The additional capacity, states one of the officials of the company, will be devoted to the production of machined forgings. From 10 to 15 cranes will be purchased for installation in these extensions. Projectile forgings have long been included among the regular products of the Atha plant. The company has received a heavy contract for military forgings from the United States government. Another new development is the award of a contract for 1,000,000 rifles, mentioned in last week's issue of *The Iron Trade Review.* This contract was let to the Westinghouse Electric & Mfg. Co. The American Bridge Co. and the American Brake Shoe & Foundry Co. continue to figure on rather small shrapnel contracts and all that is holding these companies back, it is said, is their inability to secure the necessary equipment.

A great many concerns throughout the east have begun, or are getting ready to begin work on extensions to their plants. The Bridgeport Projectile Co., Bridgeport, Conn., finally has let a contract to Samuel Austin & Son Co. for the erection of its plant to include a forge shop, a machine shop, a power plant and an accumulator building, all large structures. In addition to the Crucible Steel Co. of America and the Bridgeport Projectile Co., the concerns that are expanding include the Lake Torpedo Boat Co., Bridgeport, Conn.; the Saurer Motor Co., Plainfield, N. J.; the Eastern Machine Screw Co., New Haven, Conn.; the Pangborn Corporation, Hagerstown, Md.; the American Can Co., New York, which is to build a can plant at Lubec, Me.; the American Machine & Foundry Co., Brooklyn, N. Y.; the Hamley Iron Works, Brooklyn, N. Y.; the Auto Specialty & Equipment Co., Long Island City, N. Y.; the Lord & Burnham Co., Irvington, N. Y., which is equipping a plant at St. Katherines, Ont.; the New London Ship & Engine Co., Groton, Conn.; Landers, Frary & Clark, New Britain, Conn.; the Fore River Shipbuilding Corporation, Quincy, Mass.; the Harris-Silvers-Baker Co., Long Island City, N. Y., which is building a new structural steel fabricating plant at Dunnellen, N. J., and many others. While some of these concerns are busy on war orders, most of them are making enlargements solely to take care of domestic demand. The Harris-Silvers-Baker Co., mentioned above, is in the market for a 15-ton crane and for a number of machine tools. The General Electric Co., which during the last few days purchased a few more tools, has put out some further inquiries, including a wire-straightening machine and three radial drills. The Standard Oil Co. has bought a number of machine tools for its plant at Bayway, N. J.

The Delaware, Lackawanna & Western railroad has placed orders for a vertical milling machine and for a 36-inch swinging lathe and some orders have been placed in the east by the Missouri, Oklahoma & Gulf railroad, which closed on practically the entire list it issued a few weeks ago, as previously reported in *The Iron Trade Review.* The Lehigh & New England railroad, in addition to being in the market for a large number of machine tools for its new shops at Pen Argyle, Pa., will buy a 35-ton double-trolley and a 10-ton single-trolley electric traveling crane. The Pennsylvania railroad is inquiring for a 25-ton gantry crane. The Charlestown, S. C., navy yard will open bids direct on May 12 on some 12 machine tools. The Easton Car & Construction Co., Easton, Pa., has purchased some machine tools, including a punch. The American Smelting & Refining Co., 165 Broadway, New York, is in the market for a 10-ton crane for its plant at Perth Amboy, N. J. J. Llera, 30 Church street, New York, is in the market for a crane to handle grab buckets with ¾-cubic yard capacity. The Harrisburg Pipe & Pipe Bending Co., Harrisburg, Pa., has bought a 7½-ton magnet Cleveland crane. The Bethlehem Steel Co. has bought three Niles cranes, one 25-ton and two 10-ton. The Aberthaw Construction Co. has bought 12 ½-ton electric hoist Maris cranes and two 5-ton Maris hand cranes for installation at the Winchester Repeating Arms Co. plant at New Haven, Conn. The Scoville Mfg. Co., Waterbury, Conn., bought 32 Curtiss air hoists. The Snead & Co. Iron Works, Jersey City, which was mentioned in the last two issues of *The Iron Trade Review,* as buying a large amount of equipment for use in making war materials, has held up these purchases.

Pittsburgh Forgets Its Troubles

WITH records for the previous month again broken in April, machine tool dealers in the Pittsburgh district rapidly are forgetting the long-continued period of depression. Agents representing firms making tools suitable for the manufacture of



The most satisfactory and correct method of determining relative values is by direct comparison.

For their own information the Youngstown Sheet & Tube Co., Youngstown, Ohio, made the following test.

Notice the illustration which shows a loading platform. Above the line this platform was paved with Ayer & Lord Interior Wood Blocks. Below the line high grade concrete was laid.

Side by side these two floorings fought it out for superiority with the result that after four years of service the concrete was in very bad condition, while the ***Ayer & Lord Interior Wood Blocks*** were in as good condition as when laid.

You may wonder how this is possible. Our free little booklet "FLOORS" will tell you. Write us for a copy.

Users Always Agree!

"We have two new buildings in which we are using your blocks. One of these buildings has been in use for about eight months, and as far as we can judge, is in perfect condition, giving excellent satisfaction from every point of view. The other building has only been in use for about two months, and also is in good shape, but in view of the fact that it has not been used as long as the former, or given as hard usage, we cannot say much about it.

"The building which we have been using for the past eight months has about 7500 square feet of floor and is used as a shipping and ware room, and gets pretty hard usage at all times. As above stated, this floor has thus far given excellent satisfaction."

Ayer & Lord Tie Company

General Office, Railway Exchange, Chicago

CLEVELAND, OHIO—926 Illuminating Bldg.
KANSAS CITY, MO.—1117 Rialto Bldg.
MEMPHIS, TENN.—1402 Exchange Bldg.
PHILADELPHIA, PA.—319 Perry Bldg.

war material are unable to promise shipments that would interest an active buyer, and dealers in lines adapted only to domestic work are entertaining just about all the inquiries they can handle. The Westinghouse Air Brake Co. has concluded a program that involved the purchase of more than 500 tools of miscellaneous types, which will be installed in temporary buildings at the plant at Wilmerding. The Westinghouse Electric & Mfg. Co. and the Westinghouse Machine Co., both of which are understood to have taken additional orders for war material, are asking bids on about 100 special lathes, and the Pressed Steel Car Co. is tentatively negotiating for an indefinite number of tools. Increased tin plate capacity in this district is affording builders of rolling mill equipment an opportunity to consider a number of attractive undertakings. The McKeesport Tin Plate Co., McKeesport, Pa.; the Wheeling Steel & Iron Co., Wheeling, W. Va., and the Standard Tin Plate Co., Canonsburg, Pa., have practically completed plans for large extensions. The Pittsburgh Steel Car Co., recently organized, contemplates the erection of a modern car plant at Greenville, Pa., having a capacity of 7,500 all-steel cars annually.

Suit Attracts Wide Attention

A SUIT against Allis-Chalmers Mfg. Co., its president, Otto Falk, and others, which was instituted by Samuel Pearson at Milwaukee last week, is exciting considerable interest among concerns that since the outbreak of the war, have departed to a greater or lesser extent from their regular lines of manufacture to engage in the production of shrapnel or other war supplies to be shipped to the Allies. The suit is made possible by the so-called "discovery" statute in Wisconsin, under which Mr. Falk has been cited to appear and to bring all letters, contracts and agreements between Allis-Chalmers Mfg. Co. and the Bethlehem Steel Co. Mr. Pearson, who is an American citizen, on the ground of being a holder of property in Germany, has brought the suit to determine whether or not there is an illegal conspiracy between two companies to bring about the ruin of Germany by supplying ammunition to its enemies. While the suit probably will result in bringing out all details relative to the contracts between the Bethlehem Steel Co. and the Allis-Chalmers Mfg. Co., it is believed generally it will prove futile, insofar as the stoppage of the traffic in war supplies is its object. President Wilson, in line with his policy of keeping close watch upon everything having a bearing upon the relations between this country and the belligerents in Europe, has ordered an investigation of the bill filed at Milwaukee by Mr. Pearson.

Inquiry for machine tools is coming to dealers in Chicago from every direction. This business cannot be classified by trades, but apparently a demand has arisen on the part of large and small users for requirements ranging from a single tool to a fairly large list. Some dealers find they are able to satisfy their customers from stocks of second-hand machinery. Business is becoming hampered by inability of makers to deliver new tools for use during the present season. The call for lathes of various kinds from Europe and Canada continues and but few machines remain in possession of western dealers; stocks have been gone over thoroughly and almost everything available has been purchased. One dealer has just filled a telegraphic order for four lathes, which are shipped to Canada. Another dealer filled an order for a heavy boring machine, going into the Cincinnati district; the buyer ordered it by long distance telephone. An agricultural implement maker has just purchased a 20-inch self-oiling drill. A railroad equipment concern in the Chicago district purchased several tools during the past few days.

The purchasing department of the Chicago & North-Western railway promises that its long deferred tool list will be issued within a short time and it is believed this will call for a considerable number of tools, as the road has not bought generously for some time. This list had been expected earlier in the year, but was held up by other considerations and the promise of its early promulgation is of interest.

Cannot Get Prompt Shipment

CINCINNATI lathe manufacturers are having more business offered them than they can book, except for deliveries beyond June or July, and shipments are usually wanted at once. A large list of machine tools is in the market from Lima, O., but has not been closed because prompt shipments are specified. Very few transactions were concluded during the past week, as all machine shops are booked to full capacity on parts for lathes. Makers of lathes are practically dictating their own terms on all sales, in some cases demanding payments or deposits in advance, and stating in all contracts that orders shall not be cancelled if the war should cease. A few makers of planers and shapers have turned their plants over to the making of lathe parts, as demand for their products is still light in comparison with that for lathes. Planer and shaper inquiries, however, have increased recently. Recent orders for machinery have come mostly from domestic sources, and will be used to manufacture shrapnel for the Russian government.

EASTERN STATES

LUBEC, ME.—American Can Co., New York, will build a 3-story, 81 x 148-foot can factory in Lubec. W. M. Loney, 447 West Fourteenth street, New York, is the engineer.

BOSTON.—Wm. Duncan, 156 East Liverpool street, East Boston, has been granted a permit to build a brick and steel foundry.

LYNN, MASS. — Thurston Machinery Co. has been incorporated; $25,000 capital stock; by Frederick A. Thurston, John J. McKenzie and others.

NEW BEDFORD, MASS. — Andrew G. Pierce Jr. has organized the Pierce-Hammond Automatic Sprinkler & Heating Co., capitalized at $500,000. The company will build sprinkling and heating apparatus in combination.

WORCESTER, MASS. — Ideal Mfg. Co., general machinery, has been incorporated; $25,000 capital stock; by William A. Sault, Ernest Whitehead, James Rice.

BRIDGEPORT, CONN.—Bridgeport White Metals Casting Co., recently organized, which secured a contract for $360,000 worth of shrapnel and howitzer shells for shipment to Russia, is getting the plant of the old United Foundry & Machine Co. into shape as rapidly as possible.

GROTON, CONN.—New London Ship & Engine Co., which recently closed contracts with the United States government for submarine engines, has plans under way for further enlargements to its plant.

NEW BRITAIN, CONN.—This city has let contracts for a $180,000, 4-story, 68 x 165-foot vocational school to be erected on Bassette street.

NEW HAVEN, CONN. — Eastern Machine Screw Co. is getting ready to enlarge its plant.

NEW HAVEN, CONN.—Geo. D. Watrous, a local attorney, has purchased the idle plant of the New Haven Iron & Steel Co. in Fairhaven, for the Westrumite Products Co., of Philadelphia, which will reopen the plant in the near future, with a force of several hundred hands.

BROOKLYN. — Ironclad Mfg. Co., 929 Flushing avenue, has let contract to R. Cantor & Co., 308 Wallabout street, for an addition to its plant.

BROOKLYN.—Frank A. Aliano, 4518 Sixth avenue, has let contract for a 2-story factory, to be erected on Forty-fourth street, near Third avenue.

BROOKLYN.—Hamley Iron Works, Fortieth street and Second avenue, will build a 2-story addition; contract has been let to Post & McCord, 101 Park avenue, New York.

BROOKLYN.—Mark & Mohl, Inc., 273 Russel street, are in the market for a shear to

"INFUSO"

Trebles the Life and Increases the Strength

As no chain is stronger than its weakest link, so is no machine stronger than its weakest working unit. That working unit may be a **gear,** a **spindle,** a **clutch** or one of the numerous other essential parts. Each of those parts, even tho it may be small, has some particular duty to perform and the instant one of these breaks down under the incessant **strain** and fails to perform its work accurately, the efficiency of the entire machine is impaired.

A machine whose parts are "Infusoed" is tuned up to 99.9 percent efficiency from morning till night, year in and year out. "Infusoing" renders the parts hard and unyielding to wear as well as giving them a quality immune to strain.

Some of the best corporations turn to us to give their machine parts that indispensable quality of **hardness.** For one Cleveland concern we "Infuso" on an average 19,088 pieces a month. These weigh approximately 45,166 pounds.

"Infusoing" endows the metal with a manifold tensile strength and gives to it a hardness which increases the life of the part treated as much as 300%.

Subject "Infusoed" parts to the most severe strain either in a light machine or in a heavy machine and they will show no sign of faltering.

Rolling Mill and Mining Machinery parts given special attention.

Write us for full particulars. We want to tell you more about how "Infusoing" will enable you to cut down replacement expenses several hundred percent—how it will secure smoother running machinery because of little wear on the parts and how the machine having "Infusoed" parts is practically insured against mishaps due to breakdowns.

The Steel Improvement Co.

5003 WINDSOR AVENUE
CLEVELAND, O.

cut ⅝-inch plates, a three-plunger punch, with 20-inch throat, one upright drill one bolt-threading machine and one small circular saw.

BUFFALO.—Sowers Mfg. Co., 1300 Niagara street, which manufactures special machinery and operates a foundry, has begun work on a 1-story, 24 x 60-foot addition.

LONG ISLAND CITY, N. Y. — Auto Specialty & Equipment Co., 596 Jackson avenue, is taking bids on a 5-story, 50 x 96-foot building, to cost $50,000, to manufacture automobile supplies and accessories.

NEW YORK.—J. Llera, 30 Church street, is in the market for a crane to handle buckets with ¾-cubic yard capacity.

NEW YORK.—American Smelting & Refining Co., 165 Broadway, is in the market for a 10-ton crane for its plant at Perth Amboy, N. J.

NEW YORK.—American Machine & Foundry Co., Rufus L. Paterson, president, 200 Fifth avenue, will build a four-story, 72 x 700-foot plant, to cost $250,000 at the northwest corner of Fifty-sixth street and Second avenue, Brooklyn. Francisco & Jacobus, 200 Fifth avenue, are the consulting engineers.

SCHENECTADY, N. Y.—General Electric Co. has put out inquiries for a wire-straightening machine and for three radial drills.

ALLENTOWN, PA. — Architect Chas. Blazer, 536 Tilghman street, has plans in progress for a two-story, 20 x 100 and a 42 x 100-foot machine and tool shop to be erected for Allentown.

ERIE, PA.—The Erie Iron & Steel Co., is in the market for a large supply of annealing pots.

McKEESPORT, PA.—The board of education has awarded the contract for a $200,000 technical school building, to the Dawson Construction Co., May building, Pittsburgh; Vrydaugh & Wolfe, Pittsburgh, are the architects.

PHILADELPHIA. — Pennsylvania railroad is in the market for a 25-ton gantry crane.

PHILADELPHIA. — Architects Peuckert & Wunder, this city, are completing plans for a 1- and 2-story addition, 100 x 190 feet, to cost about $50,000, for the Pangborn Corporation, at Hagerstown, Md.

PITTSBURGH.—A contract will be placed May 12 for the new Pennsylvania railroad station at Wilkinsburg, a suburb; A. C. Shand, Philadelphia, is engineer in charge.

PITTSBURGH. — Theiss-Bygate Coal Co., capital $50,000, has been incorporated by George W. Theiss, Charles S. Bygate and M. C. Briggs, Pittsburgh; the company has offices in the Oliver building.

PITTSBURGH. — Pittsburgh Automobile Springs Co. has been incorporated; $5,000 capital stock; by W. S. Kimball, Pittsburgh; W. F. Knox, Ben Avon and John S. McKelvey Jr., Wilkinsburg.

PITTSBURGH. — Pressed Steel Car Co., which has taken a contract for material for the Russian government, according to unconfirmed reports, is tentatively negotiating for a number of machine tools.

PITTSBURGH.—Bids are being received by Architects MacClure & Spahr, Pittsburgh, for the 10-story office building which the Jones & Laughlin Steel Co. interests will erect on a lot 40 x 75 feet at Fourth avenue and Ross streets.

PITTSBURGH.—Bids will be received until May 14 for furnishing and laying car tracks and wood block paving on Bridge No. 2 over the Allegheny rvier; plans and specifications are in the office of J. C. Chalfant, county engineer.

PITTSBURGH.—Crist & Schilken Co., recently incorporated with a capital of $15,000, for the manufacture of iron and steel radiator hoods by John C. Schilken and others, has been operating a plant at 543 Fourth avenue; no new equipment will be purchased at present.

PITTSBURGH. — Pittsburgh Steel Car Co., recently organized by Pittsburgh capital, expects to erect a plant at Greenville, Pa., and will provide for a capacity of 7,500 steel cars a year; complete plant equipment will be purchased; the officers of the company are: W. A. Scott Jr., president; H. B. Scott and L. A. Meyran, vice presidents; H. W. Best, treasurer; George W. Ramby, secretary, and E. B. Caughey, office manager. The offices are at 512 Ferguson building, Pittsburgh.

PITTSBURGH. — Westinghouse Electric & Mfg. Co. and the Westinghouse Machine Co., which are understood to have received additional orders for war material, have sent out tentative inquiries for about 100 machine tools of special design. The Westinghouse Air Brake Co., which has taken contracts involving $25,000,000 worth of shells and war material, has purchased more than 500 tools which will be housed in new buildings; two of the buildings will be 100 x 500 feet; one, 65 x 200 feet; another, 80 x 150 feet, and several smaller buildings will be erected; the company may increase its equipment purchases.

SOUTH BETHLEHEM, PA.—Lehigh & New England railroad is in the market for a locomotive handling crane and some smaller cranes, in addition to a large number of machine tools for its new shops at Pen Argyle, Pa.

WASHINGTON, PA. — Standard Tin Plate Co. contemplates an extension to its plant which will double capacity; 13 mills will be added, it is unofficially announced.

DUNNELLEN, N. J.—Harris-Silvers-Baker Co., Long Island City, N. Y., is erecting a new structural steel fabricating plant in Dunnellen. It is in the market for a number of machine tools and for a 15-ton crane.

HARRISON, N. J.—Crucible Steel Co. of America has let contracts for three new buildings to be erected at its Atha plant in Harrison; one an addition to the power house and the other two, extensions to the machine shop. One of the local officials reports that the additional capacity will be devoted to the production of machined forgings, which previously have constituted a regular product of the Atha plant. The new buildings will be the result of plans which have been under consideration for a year or more. From 10 to 15 cranes and a considerable quantity of new machinery are to be purchased for the extensions. It is understood the Crucible Steel Co. has received large orders for projectiles and gun forgings from the United States government and these will be turned out at the local plant.

JERSEY CITY, N. J.—Architect John T. Rowland Jr., 98 Sip avenue, has prepared preliminary plans for a 2-story repair shop for the city, to cost about $90,000.

NEW BRUNSWICK, N. J.—A steel electrical lifting draw will be erected over the Raritan river in Albank street.

TRENTON, N. J.—Eureka Flint & Spar Co. has received bids for a one-story, 36 x 85-foot addition.

TRENTON, N. J. — East Trenton Machine Works suffered about $8,000 loss by fire recently. William H. Baker, owner, says he will rebuild plant.

TRENTON, N. J.—Fire which originated in the plant of the American Rubber Mfg. Co. caused considerable damage in that plant and also in the adjoining machine shop of Wm. H. Baker.

NEW CASTLE, DEL. — Bethlehem Steel Co. has begun work on nine one and two-story factory buildings here.

GOBANS, MD.—Machine shop of Wm. Lehnhoff, 52 Wenwood avenue, suffered damage by fire.

WASHINGTON. — Bureau of yards and docks, navy department, will receive bids until May 15 for the steel for a pattern shop at the Boston navy yard.

CENTRAL STATES

CANTON, O.—C. L. Stoner, clerk of county commissioners, will open bids May 12 for the erection of a girder bridge over Nimishillen creek, Eighth street, Canton.; county engineer has plans.

CINCINNATI.—Emery Candle Co. will enlarge its plant shortly and will require some special machinery. The details have not been determined upon.

CINCINNATI.—A 5-story automobile building will be built at Canal and Race streets by the R. K. Barlow Co. Machinery for the repairing of automobiles will be needed.

CLEVELAND.—E. G. Krause, clerk of county commissioners, will open bids May 19 for the construction of a bridge per report No. 3510. W. A. Stinchcomb, county surveyor, has plans; certified check 10 per cent.

CLEVELAND.—A. Teachout Co., interior finish sash and door manufacturer, is having plans prepared for the rebuilding of its east end plant recently badly damaged by fire. The Teachout Co. lately has taken over the Ohio Sash & Door Co. Machinery and other equipment will be needed.

COLUMBUS, O.—Manager Kelly of the industrial bureau of the chamber of commerce, who is in touch with the Victor Typewriter Co., New York, capitalized at $1,250,000 and owned by the International Textbook Co., says that company wishes to increase its capital stock and dispose of $5,000,000 issue of 7 per cent bonds and also locate near the center of its distribution where it will erect a $300,000 plant and employ 1,600 people. The Columbus chamber will attempt to float the securities and secure the plant.

LOGAN, O.—George H. Shaw, chairman of county commissioners, will open bids May 14 for erecting superstructure of a bridge across Rush creek, Marion township; certified check 5 per cent.

LOWELLVILLE, O.—Lowellville Improvement club will ask the county commissioners to construct a bridge across the river opposite the new plant of the Youngstown Iron & Steel Co.

MARIETTA, O. — Walter B. Alexander, county auditor, will receive bids until May 18 for erecting bridges as follows: Over west fork of Duck creek, over Indian run, Straight run, Bear creek and the Wooster bridge in Belpre township, plans on file with the county surveyor; certified check 5 per cent required.

NORWALK, O.—H. Whitford Jones, engineer, Cleveland, will receive bids until May 13 for generating equipment for the proposed municipal lighting plant. Mr. Jones also is preparing plans and will invite bids shortly for a switchboard, distribution system and boulevard lighting system.

PIQUA, O.—Piqua Machine & Boiler Co., recently incorporated at $10,000 by John F. O'Brien and others, intends to manufacture machinery in addition to its present machine and boiler repair business.

SPRINGFIELD, O. — Metal Label & Mfg. Co. has been incorporated to manufacture metal labels and novelties; capital stock, $10,000; by Ralph E. Taylor, Jas. B. Grimes and John B. McGrew.

WHEELING, W. VA.—Wheeling Sheet & Tin Plate Co., which operates a plant at Yorkville, O., plans to add two hot mills to its tin plate department, the addition will give the plant 12 hot tin mills; an extension, 74 x 100 feet, will be made to the shipping department; I. M. Scott is president of the Wheeling Steel & Iron Co., which controls the Yorkville plant.

BARBOURVILLE, KY.—Cumberland North-

ern railroad, which has established offices in Barbourville and will build a 25-mile steam road to Manchester, Ky., will require machinery for shops. Rails, etc., will be purchased shortly. A number of bridges will be erected.

DANVILLE, KY.—J. R. Frank is preparing to contract for the manufacture of a steel skid.

HAZARD, KY.—Kentucky-Jewell Coal Co. will install a motor generator set shortly, it is reported.

LEXINGTON, KY. — Stahel & Gries are planning to install equipment for the manufacture of vehicles.

LOUISVILLE, KY.—J. V. Pilcher Mfg. Co., which makes a patented metal bachelor button, will establish a Canadian plant; details have not been announced.

LOUISVILLE, KY.—Poole Mfg. Co., which is having a patented boiler tube cleaner made by contract, will establish a factory later. E. H. Hilpp, Kentucky Consumer's Oil Co., should be addressed.

MAYSVILLE, KY.—Limestone Lumber Co., which recently took over the plant of the Mathews Lumber Co., is planning to install additional machinery.

OWENSBORO, KY. — Anglo-American Mill Co. is to construct a 40-ton foundry addition during the next 45 days. The equipment has not been bought.

PADUCAH, KY.—West Kentucky Coal Co. will let a contract for the construction of a $100,000, steel-hull towboat; power and lighting equipment will be required.

CONNERSVILLE, IND. — Hoosier Castings Co. has been incorporated; $35,000 capital stock; by E. W. Ansted, F. B. Ansted, H. A. Wainwright.

EVANSVILLE, IND. — Fred Van Orman, manager St. George Hotel Co., has asked for sketches for a $500,000, 300-room hotel.

EVANSVILLE, IND. — Wm. M. Smith, Division street, is organizing a corporation with $100,000 capital stock to establish a plant to manufacture safety devices; about $10,000 worth of machinery will be required.

INDIANAPOLIS.—Indianapolis Union Railway Co. has been empowered to issue $4,000,000 in bonds for track elevation work. T. J. Landers is chief engineer.

INDIANAPOLIS. — Federal Pattern Works, 212 South Pennsylvania street, is in the market for wood working machinery in addition to a recent purchase amounting to about $20,000. F. D. Henzie is proprietor.

SEYMOUR, IND.—Plans are being prepared by W. E. Russ, architect, 1405 Merchants Bank building, Indianapolis, for an addition to the plant of the Seymour Woolen factory, of brick and steel, two stories, including a weaving shed, 80 x 160 feet and a dye house, 60 x 60 feet.

BLOOMINGTON, ILL.—George B. Rhinefrank, 601 Gardner building, Toledo, O., has plans for a garage, two stories, 80 x 100 feet, to cost $30,000, for George Gildner, Bloomington, who is taking bids.

BRADFORD, ILL. — Howard Mann has bought a plant in Bradford in which he will establish a steel specialty manufacturing business.

CHICAGO. — Gray Special Ford Shock Absorber Co. has increased its capital stock from $15,000 to $36,000.

CHICAGO. — D. C. Hughes & Co. manufacturers of electric specialties, have leased a plant at 4642 West Ravenswood park.

CHICAGO. — Chicago Telephone Co. has bought a site on Washington street, near Franklin, on which to erect a main operating exchange building to cost $750,000.

CHICAGO.—L. A. Stewart Co. has been incorporated to manufacture oil tanks; $2,500 capital stock; by L. A. Stewart, Loyal A. Smith and Pearl Stokburger.

CHICAGO.—Juvenile Vehicle Mfg. Co., 7401 South Hoyne avenue, recently incorporated, has increased its capital stock from $25,000 to $50,000.

CHICAGO. — Universal Stamping & Mfg. Co. has been incorporated to manufacture metal stamps, hardware and tools; $10,000 capital stock; by John Bussian, Geo. L. Peterson and Edward J. Bussian, 2348 West Twentieth street.

CHICAGO.—E. W. Sproul Co., 1120 West Thirty-fifth street, has been given the general contract for a pattern and storage building, 3 stories, 80 x 180 feet, for the Link Belt Co., W. C. Carter is superintendent.

CHICAGO.—Chicago Chandelier & Brass Co. has been incorporated to manufacture lighting fixtures; $20,000 capital stock; by C. F. Rickleffs, Wm. W. Kaiser and Chas. G. Rickleffs, 5506 Winthrop avenue.

CHICAGO.—A. E. McCallum Co. has been incorporated to manufacture machinery parts and equipment; $2,500 capital stock; by Otto Rhein, Robert Doherty and A. E. McCallum, 920 LaFayette avenue.

CHICAGO. — H. A. Streeter, 4101 East Ravenswood park, is about to erect a factory, two stories, of brick, for manufacturing metal specialties at 1419 East Ravenswood park.

CHICAGO.—Illinois Tool Works has been incorporated to manufacture machinery, tools and metal specialties; $5,000 capital stock; by Willard Wolf, Oscar D. Steirn and Noble B. Judah Jr., 134 South La Salle street.

CHICAGO.—Peerless Piston Ring Co. has been incorporated to manufacture piston rings and other machinery; $5,000 capital stock; by C. M. Hobbis, Michael Setter and Willis Melville, 109 North Dearborn street.

CHICAGO.—Allen Camp & Mfg. Co. has been incorporated to manufacture and sell lamps of brass and steel; $2,400 capital stock; by Richard Hanke, Joseph W. Allen, and Arthur Hanke, 4153 North Leamington avenue.

CHICAGO.—Automobile Engineering Co. has been incorporated to manufacture improvements for gas engines and motor cars; $2,500 capital stock; by Charles S. Frank, E. H. Foster and James Fawkner, 209 South La Salle street.

CHRISTOPHER, ILL. — Bids will be received until May 15 by John W. Dye, president of the board of local improvements, for 13 miles of 5 to 18-inch water mains.

CICERO, ILL.—Chicago Structural Steel Co. has been incorporated to fabricate and construct steel and iron work; $40,000 capital stock; by C. M. Curran, F. J. Bonner and M. Kanary, Berwyn, Ill.

DANVILLE, ILL. — Brosche & Kenlay Twentieth Century Injector & Supply Co. has been incorporated to manufacture injectors and boiler and engine supplies; by Frank Brosche, John J. Curry and W. C. Lewman and John S. Kenlay.

DIXON, ILL.—Illinois Central railroad is to replace the wooden bridge over Rock river by a steel structure. M. Johnson, Chicago, is bridge engineer.

JACKSONVILLE, ILL.—Triple Tool Co. has been incorporated to manufacture post hole diggers and other tools; $10,000 capital stock; by Fletcher J. Blackburn, Edward R. Gobeen and J. W. Walton.

LA SALLE, ILL.—Matthiessen & Hegeler Zinc Co., Chas. Brennemann, general manager, has let the general contract to the Worden Allen Co. for a $20,000 rolling mill addition, 100 x 200 feet.

NEWTON, ILL.—Streator Clay Mfg. Co. has increased its capital stock from $200,000 to $500,000.

OTTAWA, ILL.—Warren S. Bright Horseshoe Co., recently organized, is to establish a factory in Ottawa.

PERU, ILL.—Apollo Metal Co. is about to build a new plant at La Salle and move its business there.

QUINCY, ILL. — Sheridan Stove Co. has been incorporated to manufacture stoves; $75,000 capital stock; by E. H. Huenfeld, Laurence G. Smith and W. H. Covert.

JOPLIN, MO.—An election will be called

Hot Stuff

Blacksmiths strike while the iron is hot.

MR. SALESMITH,

Follow their example.

Here are some red-hot tips, STRIKE—

They're hot.

Lehigh & New England railroad is in the market for a locomotive handling crane and some smaller cranes, in addition to a large number of machine tools for its new shop at Pen Argyle, Pa.

Harris-Silvers-Baker Co., Long Island City, N. Y., is in the market for a number of machine tools and a 15-ton crane for its structural steel fabricating plant now under construction at Dunnellen, N. J.

Pennsylvania railroad is in the market for a 25-ton gantry crane.

General Electric Co., Schenectady, N. Y., has put out inquiries for a wire-straightening machine and for three radial drills.

J. Llera, 30 Church street, New York City, is in the market for a crane to handle buckets with ¾-cubic yard capacity.

American Smelting & Refining Co., 165 Broadway, New York City, is in the market for a 10-ton crane for its plant at Perth Amboy, N. J.

Wilson Foundry Co., which is erecting a machine shop at Pontiac, Mich., will need cranes for handling hot metal and castings.

Pittsburgh Steel Car Co., recently organized, plans the erection of a modern car plant at Greenville, Pa., having an annual capacity of 7,500 all-steel cars. Complete plant equipment is contemplated.

Pressed Steel Car Co., Pittsburgh, is reported to be tentatively negotiating for an indefinite number of machine tools.

Westinghouse Electric & Mfg. Co. and the Westinghouse Machine Co., Pittsburgh, are asking bids on about 100 special lathes.

Anglo-American Mill Co., Owensboro, Ky., is to construct a 40-ton foundry during the next 45 days. The equipment has not been purchased.

Federal Pattern Works, Indianapolis, Ind., is in the market for woodworking machinery in addition to a recent purchase amounting to about $20,000. F. D. Henzie is the head of the company.

Crucible Steel Co. of America, which will make large extensions to its Atha plant, at Harrison, N. J., will purchase from 10 to 15 cranes and a considerable amount of new machinery.

soon to vote on an issue of $14,000 bonds for a viaduct.

KANSAS CITY, MO.—Citizens will vote June 1 on an issue of $450,000 bonds for bridges. Henry I. Yost is mayor.

KANSAS CITY, MO.—Plans are being prepared for a factory for the Benson Brass Works at 1415 Agnes street, costing $35,000.

KANSAS CITY, MO. — John E. Loewer Wire & Iron Works Co. has been incorporated; $35,000 capital stock; by John E. Loewer, Ada H. and Belle Loewer.

KANSAS CITY, MO.—Kansas City Radiator Co. has been incorporated to manufacture radiators and heat devices; $100,000 capital stock; H. F. Hall, G. Rule, L. E. Wyne and Thos. H. Walker.

ROLLA, MO.—The county court will award a contract at its May term for a $3,200, 160-foot, steel approach, consisting of two spans, to the Dry Fork bridge, three miles south of Rolla.

SPRINGFIELD, MO.—Heer-Andres Investment Co. is considering installing a power plant to furnish light for its building. The cost will be $25,000 to $30,000 of which $18,000 will be spent in equipment. A. N. Torbitt is architect.

ST. JOSEPH, MO.—Merkel-Hines Machinery Co. has been incorporated to manufacture machinery; $25,000 capital stock; by E. J. Merkel, G. E. Hines and A. Donovan.

ST. JOSEPH, MO.—H. J. Vrooman, 1631 Frederick avenue is seeking plans for a $400,000 hotel, 10 stories, 105 x 140 feet. This will mature about August 1.

ST. LOUIS. — Sweeney Tractor Co. has been incorporated to manufacture tractors; $15,000 capital stock; by George H. Ricker, E. J. Sweeney and George E. Ricker Jr.

ST. LOUIS.—T. P. Barnett & Co., architects, Central National Bank building, are taking bids on a 16-story hotel, 83 x 100 feet, of structural steel with pressed brick facing.

ST. LOUIS.—Waters-Walch Mfg. Co. has been incorporated to manufacture typewriter supplies; $25,000 capital stock; by George B. Walch, J. Clifford Waters and others.

ST. LOUIS.—Alloyed Metals Co., 2337 Pope street, is taking bids through its architect, W. H. Gruen, Chemical building, on a foundry building, 40 x 63 feet, one story.

ST. LOUIS.—Cast Steel Locomotive Ashpan Co. has been incorporated to manufacture locomotive devices; $10,000 capital stock; H. M. Pflager, Arthur F. Morey and Fred V. Dieckmann.

ST. LOUIS.—Linde Air Products Co., home office, 30 East Forty-second street, New York City, has plans completed for a factory building of brick, reinforced concrete and steel, one story, covering about three-quarters of an acre.

DES MOINES, IA.—American Chandelier Co. has been incorporated to manufacture lighting fixtures; $15,000 capital stock; by Floyd A. Wallace, Wm. V. Wister and S. C. Rhoads.

DUBUQUE, IA.—Dubuque Boat & Boiler Co. is having plans prepared for a machine shop, one story, 50 x 75 feet. J. J. Shreiner is secretary.

IOWA FALLS, IA. — John A. Reed of Cedar Rapids, Ia., is forming a company with $200,000 capital stock to build a heating and lighting plant in Iowa Falls.

NEVADA, IA.—J. F. McDonald is planning to erect a factory to manufacture automobile tire pressure gages.

SIOUX CITY, IA. — Supervisors have approved the plans of W. L. Steele, architect, United Bank building, for a 6-story court house with a 60 x 60 foot tower, to cost $500,000.

BRAINERD, MINN.—Inland Steel Co., 1109 First National Bank building, Chicago, Ill., is about to build an experimental concentrator near Ironton and Crosby, Minn., to serve its Armor No. 1 pit mine, Armor No. 2 underground and Thompson pit mine. A contract has been made with the Cuyuna Range Power Co. for 70-horsepower electric current to operate the jigs.

MINNEAPOLIS.—C. E. Bell, 310 Security Bank building, architect, is taking bids on a garage four stories, 66 x 175 feet, for A. W. Harwood, 2644 Aldrich avenue, South.

MINNEAPOLIS.—The Wheeling Corrugating Co., Wheeling W. Va., is about to establish a plant and distributing station at Washington and University avenues.

ST. PAUL. — Farmers Terminal Packing Co., St. Paul, is preparing for a $350,000 packing plant.

SOUTHERN STATES

RICHMOND, VA.—Tredegar Iron Works is buying a large quantity of equipment for making projectiles.

CHARLESTON, S. C. — Charleston navy yard will open bids on May 12 on some 12 machine tools.

WALTERSBORO, S. C.—The board of commissioners of public works, will receive bids till May 14 for two 100-horsepower boilers, one 200-horsepower feed water heater with pump, one steam engine for direct connection to generator, one 50-kilo-volt-ampere generator, two 750-gallons-per-minute steam pumps, one triplex service pump, etc.

ATLANTA, GA.—W. A. Williams, Lima, O., is said to have plans for an auto manufactory at Atlanta.

NATCHITOCHES, LA.—On authorization of the police jury a steel bridge will be erected across Crane river, 9 miles below Natchitoches.

BLYTHEVILLE, ARK.—Southwestern Utilities Co. has increased its capital stock from $425,000 to $800,000. The company controls power plants in Blytheville and at several points in Missouri.

LITTLE ROCK, ARK. — Chicago, Rock Island & Pacific Railway is to build a car repair shop at Biddle, Ark., (post office Little Rock) costing $60,000. C. A. Morse is chief engineer.

STUTGART, ARK.—F. L. Wilcox, Syndicate Trust building, St. Louis, is making plans for a water works and electric light plant costing $100,000 for Stutgart.

CHATTANOOGA, TENN.—Andrews Paper Box Co. is preparing to build an addition to its factory, which will be equipped for the manufacture of trunks.

JOHNSON CITY, TENN. — Johnson City Lumber & Mfg. Co. will build a factory for the production of vehicle and table rims and other wood specialties. Edgar Wallin is buying the machinery which will cost about $25,000.

MARYSVILLE, TENN. — Naughton Grate Bar Co. will manufacture culverts, and will purchase riviting and bending machinery.

NASHVILLE, TENN.—Federal Mfg. Co., manufacturer of automobile wheels, has increased its capital stock from $100,000 to $200,000.

PARIS, TENN.—People's Ice & Coal Co. will build an addition and install machinery at a cost of $10,000.

SOUTH PITTSBURGH, TENN. — Haskew Lumber Co. is getting prices on equipment to manufacture wooden handles and other specialties.

ARANSAS PASS, TEX. — City council is considering spending $35,000 for improvements and extensions to the water works and electric light plants.

BRISTOW, OKLA.—Bristow Ice & Light Co. has been incorporated; $15,000 capital stock; by J. C. Vicker, H. M. Vicker, O. Vaught.

EUFAULA, OKLA. — Missouri, Kansas & Texas railroad is to build a bridge over the Southern Canadian river consisting of ten 100-foot single track deck girders, aggregating about 750 tons of steel. Leon L. Lonnbladh, Dallas, Texas, is chief engineer.

HUGO, OKLA.—Hugo Ice & Light Co. is to install a 500-kilowatt turbine driven generator with condenser and auxiliaries and a 400-horsepower water tube boiler.

OILTON, OKLA.—Dil Belt Terminal Co. is to build 150-foot, steel span in place of a wooden bridge recently washed away.

OKLAHOMA CITY. — Bids will be taken until June 7 by the state capitol commission, R. L. Williams, governor, chairman, for the construction and mechanical equipment of a new state capitol.

OKLAHOMA CITY. — Carr Safety Appliance Co. has been incorporated to manufacture safety specialties including an automatic gas cutoff, safety stop for steam engines, etc.; $5,000 capital stock; by S. C. Carr, president; C. F. Dyer, vice president; B. E. Chapin, secretary-treasurer.

OKMULGEE, OKLA. — Luster Mfg. Co. which was recently incorporated for $12,000 by M. C. Luster, Box 107, Okmulgee, to manufacture patented harrows, will make harrows by contract at present; a plant will be built later.

POTEAU, OKLA.—Poteau Foundry & Machine Co. recently incorporated by F. E. Tyler and others with capital stock of $25,000 is to build a foundry and machine shop soon at a cost of $300,000.

SAPULPA, OKLA.—Mahoney Pump Co. has bought a site and is about to erect a factory 80 x 180 feet.

TULSA, OKLA.—This city has voted $200,000 for a bridge over Arkansas river.

TULSA, OKLA.—Oklahoma Iron Works is planning to erect an addition, 74 x 250 feet, and install electric power for its machinery.

WESTERN STATES

BROKEN BOW, NEB.—This city has voted $10,000 bonds for establishing an electric lighting plant.

HARTINGTON, NEB. — The Commercial club is considering a bridge over the Missouri river connecting this county with Yankton, S. D., at a cost of $800,000. The city of Yankton has raised $380,000 toward the cost.

LAWRENCE, KAN. — Tarpy Iron Works suffered loss by fire recently, much machinery being damaged.

NEWTON, KAN.—Contract will be let about July 15 for a new water works system including a 3,500,000-gallon deep well pump and nine miles of 16-inch pipe at a cost of about $150,000. F. E. Devlin is city engineer.

SOLOMON, KAN.—Plans are being made for a water works system by Harper & Styles, engineers, 915 Grand avenue, Temple building, Kansas City, to cost $25,000 to $30,000.

SYRACUSE, KAN.—Syracuse Pump & Mfg. Co. has been incorporated to manufacture irrigating pumps and machinery; $30,000 capital stock; by G. E. Helfrich, H. Helfrich and Samuel Yaggy.

BILLINGS, MONT. — Burnsley Brothers Cutlery Co., Monett, Mo., is about to build a plant here, 50 x 100 feet, and will move its business from Monett.

GILLETT, WYO.—Plans have been made by Royal Salisbury, New Castle, Wyo., for an electric light plant in Gillett.

ARTESIA, N. M.—Commissioners of Eddy county have instructed the state engineer, James A. French, Santa Fe, to prepare plans for a 250-foot steel bridge over Pecos river, three miles north of Artesia.

SEATTLE.—A. W. Swanitz, engineer, who had to do with laying out the Alaska Northern railroad, recently acquired by the government, announced, while in Seattle recently, that examinations are to be made of the iron

ore deposits at Nome and at Seldova on Cook inlet with a view of establishing a pig iron and steel industry. The projects are said to backed by the largest smelting concerns in the country.

PORTLAND, ORE.—Thomas L. Shevlin, Shevlin Lumber Co., Minneapolis, recently made a trip through his company's holdings on the upper Deschutes river with a view of bringing negotiations to a head for constructing a railroad from Bend, Ore., into the timber section and providing for the erection of sawmills.

BAKERSFIELD, CAL.—Lake View Oil Co. No. 1 is planning to install an electric generating plant, five 70-horsepower boilers, lathes and other shop equipment will be required. W. J. Burnhart, superintendent.

LOS ANGELES.—Citizens have voted $6,500,000 in bonds for an electric light plant in an effort to obtain 3-cent electricity.

LOS ANGELES. — Commercial Machine Works & Supply Co. has been incorporated to manufacture pumps, motors and engines; $100,000 capital stock; W. W. Pine, J. L. Sebastian and D. O. Mark, 3837 Twentieth street.

LOS ANGELES. — Western Metals Co., a newly-formed corporation, has purchased a 6-acre tract at Harbor Industrial City as a site for an antimony reduction plant. The officers, all of Los Angeles, are: Meyer Elsasser, president; Leslie C. Mott, vice president, and Henry R. Simpson, secretary-treasurer.

MERCED FALLS, CAL. — A. J. Wishon, general manager of the San Joaquin Light & Power Co., Fresno, Cal., is about to install at Merced Falls a new generating unit to increase the voltage of transmission line from 30,000 to 60,000 volts, at a cost of $75,000.

SAN FRANCISCO.—D. E. Laitte Gas Machine Co. has been incorporated; $300,000 capital stock; by W. R. Broomfield, A. A. Rosenshine and W. P. Johnson.

STOCKTON, CAL.—Stockton Engineering & Foundry Co. has been incorporated; $100,000 capital stock; by D. F. Grimsley, S. G. Mix and M. Davidson.

New Trade Publications

STARTERS. — The Crocker-Wheeler Co., Ampere, N. J., has issued a bulletin describing its line of starters for induction motors. The mode of operation and the advantages of this type of equipment are explained in detail.

TURBINES.—The Kerr Turbine Co., Wellsville, N. Y., has issued a bulletin devoted to its line of geared turbines. The advantages obtained by interposing gears between the turbine and the driven generator, pump, blower or pulley are discussed. The method of making the gears used on the Kerr turbines is explained in detail.

BALL BEARINGS.—A handsomely illustrated catalog devoted to its line of ball bearings has been issued by the New Departure Mfg. Co., Bristol, Conn. The catalog discusses the uses of ball bearings as they affect the owner of motor cars. The development and advantages of the ball bearing are explained in detail.

AIR COMPRESSORS.—A 32-page catalog describing its line of portable air compressors has been issued by the Ingersoll-Rand Co., 11 Broadway, New York. The use of portable air compressing outfits by contractors, mine operators and others who employ air tools in connection with work of a temporary character is discussed in detail.

DRILL MOUNTINGS. — The Ingersoll-Rand Co., 11 Broadway, New York, has issued a small bulletin covering its line of drill mountings, with or without water feed and designed especially for flat hole work, such as drifting and underhand stoping in metal mines where shallow holes are required, and for breaking down coal and driving gangways in coal mines.

FORCING PRESSES. — A comprehensive catalog covering hydraulic forcing presses, briquetting presses, bulldozers, scrap baling presses, etc., has been issued by the Watson-Stillman Co., 50 Church street, New York. Numerous illustrations coupled with descriptive data are given covering presses of all types and sizes for every conceivable shop purpose.

OIL FILTERS. — The Richardson-Phenix Co., Milwaukee, has issued a catalog devoted to the construction and operation of its new power plant oil filter. It is stated that filters of this type having a total filtering capacity of over 1,500,000 gallons are now in service. The catalog is well illustrated and contains data and charts on interesting tests that have been made with this type of filter.

PORTABLE DRILLS.—Bulletin No. 103 issued by the Hisey-Wolf Machine Co., Cincinnati, describes a line of portable electric hand and breast drills manufactured by this concern. These drills are designed either for alternating or direct current. Special attention is given to details of construction including armature bearings, which are of the combination thrust and annular ball type.

BORING TOOLS.—A six-page folder has been issued by the Allen & Curtiss Co., Mishawaka, Ind., describing the features of an adjustable boring tool that this concern manufactures. It may be used on a lathe or milling machine, and is built in several sizes to bore holes from 1 inch to 5¾ inches in diameter; it is provided with a single adjustment and has no projecting lugs or screws.

SIROCCO PRODUCTS. — An exceedingly handsome, 32-page catalog devoted to heating, ventilating and humidifying by the fan system, has been issued by the American Blower Co., Detroit. The Sirocco fan, built on the many-blade plan, is the blowing unit of this system for heating, ventilating and air conditioning. A large number of illustrations are included showing various buildings and plants in which this system has been installed.

BUILDING MATERIALS. — The Brown-Wales Co., Boston, has issued a 64-page catalog devoted to its line of fireproof building materials. The catalog contains descriptions of the company's line of roofing, pipe, siding, metal shingles, ventilators, etc. Directions are given showing the correct methods of using these products. A portion of the catalog is devoted to the company's line of square and hexagon nuts, carriage bolts, lag screws and turn buckles.

TRANSFER AND LARRY CARS. — An attractive 32-page booklet has been issued by the Brown Hoisting Machinery Co., Cleveland, covering the latest developments in transfer cars and larries for handling iron ore, coke, limestone, coal, etc. Particular attention is devoted to transfer cars and larries for handling ore and coke in connection with blast furnace installations. The booklet contains a large number of illustrations showing typical Brown-Hoist installations in various parts of the country.

DRILL AND GRINDER.—Two circulars have been issued by the Stow Mfg. Co., Binghamton, N. Y., devoted respectively to a new type ½-inch electric breast drill and to a tool post grinder, both hand feed and plain. The breast drill can be operated either by alternating or direct current. The tool post grinder is adapted for grinding centers, dies, cutters, etc., and does both internal and surface grinding. It is supplied with a ⅜ x 6-inch emery wheel, internal grinding attachment, flexible cord and plug to fit any standard lamp socket.

DRILLS AND REAMERS.—A handsomely illustrated 92-page catalog has been issued by the Celfor Tool Co., Buchanan, Mich., describing a line of high speed twist drills, reamers, flue cutters, lathe tools and internal gear drive axles. Fifty-two pages are devoted to illustrations and descriptions of the high speed twist drills manufactured by the Celfor company. The other illustrated descriptive matter includes flat beaded drills, chucking reamers, drill chucks, drill sockets, lathe tool holders, high speed tool bits, flue cutters and drill gages.

ELECTRIC ARC WELDING.—"Variable Voltage Arc Welders" is the title of a 16-page bulletin issued by the Welding Materials Co., 114 Liberty street, New York City. The subject of electric arc welding is considered at length and suggestions for both welding and cutting by this method are described in detail. Numerous illustrations are included showing welds made by this process, including motor frames, street railway truck frames, steel plates, barrels, cylinders, etc. The welding outfit also is illustrated, including the electrode holder, shields for the protection of operators, etc.

CONVEYORS.—A 56-page catalog recently has been issued by the Otis Elevator Co., New York, devoted to its line of gravity spiral conveyors for lowering package merchandise and boxed, cased, bagged and barreled goods. These conveyors are designed to utilize gravity in conveying merchandise on fixed spiral blades within a circular shaft from upper to lower floors. They are adapted also for use in factories where the manufacturing process is from the top floor downward. The catalog shows the different types of conveyors and contains interesting descriptions of their operation. Illustrations are shown of these conveyors in service.

FOUNDRY EQUIPMENT.—A series of bulletins has been issued by the Coleman Foundry Equipment Co., Cleveland, which illustrate and describe the extensive line of foundry equipment buit by this company. One bulletin is devoted to natural draft, coke burning crucible furnaces, which are described in detail and one of the many installations of this type of melting medium is shown. A 16-page bulletin is devoted to ovens for drying cores and molds. Large installations of the rolling drawer type are shown, as well as combination car and rolling drawer ovens. In addition, other bulletins are devoted to a squeezer molding machine, water tumbling mill, sprue cutter and aluminum furnaces.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Delivery to July 1.)

Bessemer, valley	$13.60
Bessemer, Pittsburgh	14.55
Basic, Pittsburgh	13.45
Basic, eastern Pa.	13.25
Malleable, Pittsburgh	13.45 to 13.95
Malleable foundry, Chicago	13.00
Malleable foundry, Philadelphia	15.00 to 15.25
Malleable foundry, Buffalo	12.50 to 13.00
No. 1X foundry, Philadelphia	14.54 to 14.79
No. 2 foundry, Pittsburgh	13.45 to 13.95
No. 2 foundry, valley	12.50 to 13.00
No. 2 foundry, Cleveland	13.25
No. 2 foundry, Ironton	12.75 to 13.00
No. 2 foundry, Chicago	13.00
No. 2X foundry, Philadelphia	14.00 to 14.25
No. 2X fdy., N. J. tidewater	14.25 to 14.50
No. 2X foundry, Buffalo	12.50 to 13.00
No. 2 plain, Philadelphia	13.75 to 14.00
No. 2 plain, N. J. tidewater	14.00 to 14.25
No. 2 plain, Buffalo	12.25 to 12.50
No. 2 southern, Birmingham	9.75 to 10.00
No. 2 southern, Cincinnati	12.65 to 12.90
No. 2 southern, Chicago	13.50 to 14.00
No. 2 southern, Phila. delivery	13.75 to 14.00
No. 2 southern, Cleveland	13.75 to 14.00
No. 2 south'n, New York docks	13.50 to 13.75
No. 2 southern Boston, docks	13.50 to 13.75
No. 2 south. interior, New Eng.	14.25 to 15.25
No. 2 southern, St. Louis	12.90 to 13.40
Virginia No. 2X furnace	12.50 to 13.00
Virginia 2X, Philadelphia	15.25
Virginia 2X, Jersey City	15.50
Virginia 2X, Boston points	15.75
Gray forge, eastern Pa.	13.25 to 13.50
Gray forge, Pittsburgh	13.20
Gray forge, Birmingham	8.75 to 9.00
Silveries, 8 per cent, Jackson, O.	14.75 to 15.25
Silveries, 5 per cent Birmingham	12.50
Silveries, 5 per cent, Chicago	16.35
Standard low phos., Phil.	19.00 to 20.00
Lebanon low phos., furnace	16.00 to 16.50
Low phos., Pittsburgh	20.95 to 21.20
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	15.25 to 16.25
Charcoal, Buffalo	15.75 to 17.00
Charcoal, Birmingham	25.00

IRON ORE

(Lower lake ports.)

Old range Bessemer, 55 per cent	$3.75
Mesabi Bessemer, 55 per cent	3.50
Old range, non-Bess., 51½ per cent	3.00
Mesabi non-Bessemer, 51½ per cent	2.85

(Per unit Philadelphia.)

(Prices nominal.)

Foreign Bess., 50 to 65 per cent.	7½c to 8½c
For'n non-Bes., 50 to 65 per cent	7½c to 8½c

COKE

(At the ovens)

Connellsville furnace	$1.55 to 1.60
Connellsville fur. contr.	1.65 to 1.75
Connellsville foundry	2.00 to 2.40
Connellsville fdy. contr.	2.25 to 2.50
Wise county furnace	1.75 to 2.00
Wise county foundry	2.10 to 2.40
Pocahontas furnace	1.75 to 2.00
Pocahontas foundry	2.00 to 2.25
New River, foundry	2.50 to 3.00
New River, furnace	2.00 to 2.25

FERRO-ALLOYS

Ferro-mang., Balti. (prompt)	$90.00 to 100
Ferro-mang. (future), Balti.	88.00
Ferro-silicon, 50 per cent, Pbgh.	71.00 to 73.00
Ferro-silicon, 50 per cent, Phila.	71.00 to 73.00
Ferro-sil., 12 to 13 per cent.	18.00 to 18.50
Ferro-sil., 11 to 12 per cent.	17.00
Ferro-sil., 10 to 11 per cent.	16.00
Ferro-sil., 9 to 10 per cent.	15.00

(Ferro-silicon quoted at furnace Ashland, Jackson and New Straitsville)

Ferro-carbon titanium, carloads, per lb.	8c to 12½c

SEMI-FINISHED STEEL

Open hearth billets, Phila.	$22.06 to 22.56
Forging billets, Phila.	25.06 to 25.56
Forging billets, Pbgh.	24.50 to 25.00

Freight Rates via Panama Canal

Rates on finished materials, including plates, shapes, bars, wire, nails, etc., to Pacific coast points via Panama canal, per 100 lbs., in carload lots, exclusive of insurance and dockage.

From New York	$0.45
From Pittsburgh	.619
From Youngstown	.639
From Niles	.619
From Wheeling	.619
From Steubenville	.619
From Johnstown	.604
From Coatesville	.545
From Steelton	.555
From Bethlehem	.529
From Cleveland	.65
From Chicago	.765

Rates on sheet mill products $2 per ton higher.

Wire rods, Pittsburgh	$25.00
Billets, Pittsburgh	19.50 to 20.50
Billets, Youngstown	18.50 to 19.50
Sheet bars, Pittsburgh	20.00 to 21.00
Sheet bars, Youngstown	19.00 to 20.00
Muck bar, Pittsburgh	27.00

RAILS AND TRACK MATERIAL

Stand. Bess., rails, Pbgh.	1.25c
Stand. open-hearth rails, Pbgh.	1.34c
Lgt. rails, 8-lbs., Pbgh. & Chgo.	1.22c
Lgt. rails, 12 lbs., Pbg. & Chgo.	1.17c
Lgt. rails, 16 to 20 lbs., Pgh. & Chgo.	1.12c
Lgt. rails, 25 to 45 lbs., Pbgh. and Chgo.	1.07c
Relaying rails, standard, Pbgh. & Chgo.	$23.00 to 24.00
Relaying rails, light, Chicago	21.50 to 22.50
Angle bars, st. sect, Pbgh. base	1.50c
Angle bars, st. sections, Chicago	1.50c
Spikes, railroad, Pbgh.	1.35c to 1.40c
Spikes, railroad, Chgo.	1.50c
Track bolts, Pbgh.	1.85c to 1.90c
Track bolts, Chgo.	2.00c

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—	
Cleveland	$0.95
Newark, N. J.	3.00
New England	3.00
Philadelphia	2.79
Pittsburgh	.95
St. Louis	3.18
Buffalo to:—	
Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58
New York and Brooklyn (by canal)	1.00 to 1.50
Virginia furnaces to:—	
Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88
Birmingham, Ala., to:—	
Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
New York (all rail)	6.15
New York (rail and water)	4.25
Philadelphia (all rail)	5.20
Philadelphia (rail and water)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75
Chicago, to:—	
Des Moines	$2.80
Milwaukee	.50
Moline, Ill.	1.47
Omaha	3.58
St. Louis	1.58
Ironton and Jackson, O., to:—	
Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58

SHAPES, PLATES AND BARS

Structural shapes, Pittsburgh	1.20c
Structural shapes, Chicago	1.34c to 1.39c
Structural shapes, Philadelphia	1.359c
Structural shapes, New York	1.369c
Struc. shapes, San Francisco	2.00c to 2.05c
Tank plates, Chicago	1.29c to 1.39c
Tank plates, Pittsburgh	1.10c to 1.20c
Tank plates, Philadelphia	1.359c
Tank plates, New York	1.369c
Bars, soft steel, Pittsburgh	1.20c
Bars, soft steel, Chicago	1.39c
Bars, soft steel, Philadelphia	1.359c
Bars, soft steel, New York	1.369c
Hoops, carloads, Pittsburgh	1.25c to 1.30c
Bands, Pittsburgh	1.20c
Shafting, Pbgh., carloads.	68 to 70 per cent off
Screw stks., Pgh. carl'ds,	68 to 70 per cent off
Bar iron, Chicago	1.15c
Bar iron, Philadelphia	1.175c to 1.225c
Bar iron, New York	1.125c
Bar iron, Cleveland	1.20c to 1.25c
Bar iron, Pittsburgh	1.20c to 1.25c
Hard steel bars, Chicago	1.20c to 1.25c
Smooth finish, mchy. steel, Chi.	1.68c

SHEETS AND TIN PLATE

No. 28, black, Pittsburgh	1.80c to 1.90c
No. 28, black, Chicago	1.94c to 1.99c
No. 28, tin mill, black, Pbgh.	1.85c to 1.90c
No. 28, galvanized, Pbgh.	3.30c to 3.40c
No. 28, galvanized, Chgo.	3.59c
No. 10, blue, annealed, Pbgh.	1.35c
No. 10, blue, annealed, Phila.	1.459c to 1.509c
Tin plate, 100 lb., coke base	3.20c to 3.35c

EXTRAS FOR SHEET OR TIN MILL SPECIFICATIONS

(Per hundred pounds.)

Single pickled, cold roll, and re-anl.	30 cents
Hot roll'd pickl'd and anl., tin mill	25 cents
Full pickl'd, cold rolled and re-anl.	50 cents
Auto sheets	75 cents
Blued stove pipe stock	10 cents
Range steel	30 cents
Re-squaring	10 cents
Roller leveling	10 cents
Patent leveling and re-squaring	35 cents
Oiling sheets	10 cents
Deoxidizing	10 cents
Lime finish	10 cents
Open-hearth stamping steel, free from mill scale	55 cents
Special open hearth deep stpg. steel free from mill scale	80 cents

Extra deep special auto body stock $1.25
Ext. for 28 gage ov. 32 to 36-in. wide 10 cents
No reduction for sheets not annealed.

The above extras apply on both sheet and tin mill specifications, at the same rate.

IRON AND STEEL PIPE

(Pittsburgh.)

	Black. Butt-weld.	Galv. Butt-weld.
Steel, ¼ to 3 inches	79	68½
Iron, ¼ to 2 inches	71	57
	Lap-weld.	
Steel, 2½ to 6 inches	78	67½

BOILER TUBES

Steel, 3½ to 4½ inches l. c. l.	74
Iron, 3½ to 4½ inches l. c. l.	62

WIRE PRODUCTS

(Retailers' price 5 cents above jobbers' quotation.)

Wire nails, jobbers, Pittsburgh	$1.55 to 1.60
Plain wire, jobbers, Pittsburgh	1.35 to 1.40
Galvanized wire, jobbers, Pbgh.	1.85 to 1.90
Polished staples, Pbgh.	1.55 to 1.60
Galvanized staples, Pbgh.	2.05 to 2.10
Barb wire, painted, jobbers, Pbgh.	1.55 to 1.60
Barb wire, galv., jobbers, Pbgh.	2.05 to 2.10

IRON AND STEEL PRICES

Corrected up to Tuesday noon

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ⅜ x 6 inches, smaller or shorter, rolled threads, 80 and 15; cut threads 80 and 10; larger or longer, 75 and 17½.

Machine bolts with hot pressed nuts ⅜ x 4 inches, smaller or shorter, rolled 80 and 20; cut, 80 and 15; larger or longer, 80.

Gimlet and cone point lag or coach screws, 85 and 2½.

Hot pressed square, blank or tapped nuts. $6.40 off list; hot pressed hexagon blank or tapped, $7.30 off.

Cold pressed, square, blank or tapped, $6.10 off; hexagon, blank or tapped, ⅝ inch and larger, $7.50; ⅜-inch and smaller, $8.00.

RIVETS

Structural rivets, Pbgh.....	1.45c to 1.50c
Structural rivets, Chgo.....	1.68c
Boiler rivets, Pbgh.....	1.55c to 1.60c
Boiler rivets, Chgo.....	1.78c

STEEL SHEET PILING

(Pittsburgh.)

Base sizes	1.55c to 1.60c

COLD ROLLED STRIP STEEL

(Subject to regular extras.)

0.10 to 0.19 Carbon.	Base price Cut to length Hard.	Soft.
1½ inch and wider	2.85	3.10
0.100 and thicker.....	2.95	3.20
0.050 to 0.099 inc.....	3.10	3.35
0.035 to 0.049 inc.....	3.35	3.75
0.031 to 0.034 inc.....	3.60	4.00
0.025 to 0.030 inc.....	3.80	4.20
0.020 to 0.024 inc.....	4.70	5.20
0.017 to 0.019 inc.....	5.10	5.60
0.015 and 0.016.....	5.95	6.45
0.013 and 0.014.....	6.55	7.05
0.012	6.90	7.40
0.011	7.25	7.75
	Coils.	
0.100 and thicker.....	2.75	3.00
0.050 to 0.099 inc.....	2.80	3.05
0.035 to 0.049 inc.....	2.95	3.20
0.031 to 0.034 inc.....	3.10	3.50
0.025 to 0.030 inc.....	3.20	3.60
0.020 to 0.024 inc.....	3.30	3.70
0.017 to 0.019 inc.....	3.60	4.10
0.015 and 0.016.....	4.00	4.50
0.013 and 0.014.....	4.70	5.20
0.012	5.05	5.55
0.011	5.40	5.90
0.010	5.75	6.25

CAST IRON WATER PIPE

Six to 48-in., Cleveland.....	23.75
Four-inch, Chicago	26.00
Six to 12 inches, Chicago.....	24.00
Large sizes, Chgo.....	23.00
Six-inch, New York.....	20.50 to 21.50
Four-inch, New York.....	21.50 to 22.50
Four-inch, Birmingham.....	19.50
Six-inch and larger, Birmingham	19.50

Gas pipe, $1 per ton higher than water.

WAREHOUSE PRICES

Steel bars, Chicago.....	1.65c
Steel bars, Cleveland.....	1.80c
Steel bars, Cincinnati.....	1.75c to 1.80c
Steel bars, Philadelphia.....	1.70c
Steel bars, New York.....	1.80c
Steel bars, St. Louis.....	1.70c
Iron bars, Chicago.....	1.65c
Iron bars, Cleveland.....	1.75c
Iron bars, St. Louis.....	1.65c
Iron bars, Cincinnati.....	1.70c to 1.80c
Iron bars, Philadelphia.....	1.55c
Iron bars, New York.....	1.65c to 1.70c
Hoops, Chicago.....	2.15c
Shapes and plates, Chicago.....	1.75c
Shapes and plates, Cleveland...	1.90c
Shapes and plates, Cincinnati...	1.85c to 1.90c
Shapes and plates, St. Louis....	1.80c
Shapes and plates, Philadelphia.	1.70c
Shapes and plates, New York...	1.85c
No. 10 blue anl. sheets, Chgo...	1.95c
No. 10 blue anl. sheets, Cleve...	2.05c
No. 10 blue anl. sh. St. Louis...	2.00c
No. 10 blue anl. sheets, Cinci...	2.00c
No. 28 black sheets, Chgo.....	2.55c
No. 28 black sheets, Cleveland..	2.45c
No. 28 black sheets, Cincinnati..	2.45c to 2.55c
No. 28 black sheets, St. Louis..	2.55c
No. 28 galv. sheets, Chgo.....	3.75c
No. 28 galv. sheets, Cleveland...	3.50c
No. 28 galv. sheets, Cincinnati..	3.40c to 3.55c
No. 28 galv. sheets, St. Louis...	3.75c

Freight Rates, Coke

Connellsville regions, per 2,000 lbs., to:—	
Baltimore	$1.80
Buffalo	1.85
Chicago	2.50
Cleveland	1.60
Detroit	2.10
East St. Louis.....	2.80
Joliet	2.50
Louisville	2.50
Milwaukee	2.70
New York	2.85
Philadelphia	2.05
Pittsburgh	.75
Richmond, Va.	2.94
Toledo	1.85
Valley Furnaces	1.20
Cincinnati	2.00

IRON AND STEEL SCRAP

(Net Tons.)

No. 1 railroad wrought, Chgo...	$ 8.50 to 9.00
No. 1 railroad wrought, Cleve...	9.75 to 10.00
No. 1 railroad wrought, St. L..	8.00 to 8.50
No. 1 railroad wrought, Cincin.	7.50 to 8.00
No. 2 railroad wrought, Chgo...	8.25 to 8.50
No. 2 railroad wrought, St. L..	7.50 to 7.75
Arch bars and transoms, Chgo..	11.75 to 12.25
Arch bars and transoms, St. L.	11.00 to 11.50
Knuckles, coup. & spr'gs, Chgo.	8.75 to 9.00
Knuckles, coup. & spr'gs, St. L.	8.25 to 8.50
Shafting, Chicago	11.50 to 12.00
Shafting, St. Louis.....	11.00 to 11.50
Steel car axles, Chicago.....	10.50 to 11.00
Steel car axles, St. Louis.....	10.00 to 10.50
Locomotive tires, Chicago.....	8.50 to 9.00
Locomotive tires, St. Louis.....	9.00 to 9.25
Cut forge, Chicago.....	8.25 to 8.75
Pipes and flues, Chicago.....	6.25 to 6.75
Pipes and flues, Cleveland.....	7.25 to 7.50

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 lbs. to:—	
New York	16.9 cents
Philadelphia	15.9 cents
Boston	18.9 cents
Buffalo	11.6 cents
Baltimore	15.4 cents
Cleveland	10.5 cents
Cincinnati	15.8 cents
Chicago	18.9 cents
Minneapolis and St. Paul.....	32.9 cents
Denver	68.6 cents
St. Louis	23.6 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast, (all rail).....	80 cents
Pacific coast, via Panama canal	61.9 cents

Pipes and flues, St. Louis.....	6.00 to 6.50
No. 1 cast, Chicago.....	9.00 to 9.25
No. 1 cast, Cleveland.....	10.00
No. 1 cast, Cincinnati.....	8.50 to 9.00
No. 1 cast, St. Louis.....	9.00 to 9.25
No. 1 busheling, Chicago.....	7.25 to 7.75
No. 1 busheling, Cleveland.....	8.25 to 8.50
No. 1 busheling, Cincinnati.....	6.00 to 6.50
No. 1 busheling, St. Louis.....	7.00 to 7.25
No. 2 busheling, Chicago.....	6.00 to 6.50
No. 1 boiler plate, cut, Chgo...	5.50 to 5.75
No. 1 boiler plate, cut, St. L...	5.50 to 5.75
Boiler punchings, Chicago.....	8.25 to 8.75
Cast borings, Chicago.....	5.25 to 5.50
Cast borings, Cleveland.....	6.00 to 6.25
Cast borings, Cincinnati.....	4.75 to 5.25
Cast borings, St. Louis.....	4.75 to 5.25
Machine shop turnings, Chicago.	5.00 to 5.50
Machine shop turnings, Cleve...	5.75 to 6.00
Machine shop turnings, Cinci..	$ 4.25 to 4.75
Machine shop turnings, St. L...	5.25 to 5.75
Malleable agl., Chicago.....	7.50 to 7.75
Malleable agricultural, St. Louis.	6.00 to 6.50
Malleable, railroad, Chicago.....	7.75 to 8.25
Malleable, railroad, Cincinnati..	6.00 to 6.50
Malleable, railroad, St. Louis...	6.50 to 7.00
Angle bars, iron, Chicago.....	11.50 to 12.00
Angle bars, iron, St. Louis.....	9.50 to 10.00
Angle bars, steel, Chicago.....	8.25 to 8.50
Angle bars, steel, St. Louis.....	8.00 to 8.25
Stove plate, Chicago.....	7.75 to 8.00
Stove plate, Cleveland.....	8.00 to 8.50
Stove plate, Buffalo.....	8.25 to 8.75
Stove plate, Cincinnati.....	6.00 to 6.50
Stove plate, St. Louis.....	6.50 to 6.75
Bundled sheet, Cincinnati.....	4.75 to 5.25

(Gross tons.)

Heavy melting steel, Pbgh.....$	11.75 to 12.00
Heavy melting steel, Buffalo...	10.50 to 11.00
Heavy melting steel, Chgo.....	9.25 to 9.50
Heavy melting steel, Cleveland.	10.00 to 10.25
Heavy melting steel, Cincinnati	8.50 to 9.00
Heavy melting steel, eastern Pa.	11.00 to 11.50
Heavy melting steel, New York.	8.75 to 9.00
Heavy melting steel, St. Louis..	9.50 to 10.00
Bundled sheet, Buffalo.....	7.00 to 7.50
Grate bars, Buffalo.....	9.00 to 9.50
Grate bars, New York.....	6.50 to 7.00
No. 1 railroad wrought, east. Pa.	12.50 to 13.00
No. 1 railroad wrought, Pbgh..	10.25
No. 1 R. R. wght., New York..	10.50 to 11.00
No. 1 R. R. wrought, Buffalo..	10.50 to 11.00
Shafting, New York.....	12.50 to 13.00
Shafting, eastern Pa.....	15.00 to 15.50
Wrought pipe, New York.....	8.00 to 8.25
Wrought pipe, eastern Pa.....	10.25 to 10.50
Mch. shop turnings, New York.	6.00 to 6.25
Machine shop turnings, Buffalo.	5.75 to 6.25
Mch. shop turnings, Pbgh.....	7.75 to 8.00
Mch. shop turnings, eastern Pa.	8.00 to 8.50
Cast borings, New York.....	5.75 to 6.00
Cast borings, eastern Pa.....	8.00 to 8.50
Cast borings, Buffalo.....	6.50 to 6.75
Cast borings, Pittsburgh.....	8.25 to 8.50
Stove plate, N. J. points.....	8.50 to 9.00
Stove plate, Pittsburgh.....	8.25 to 8.75
Stove plate, eastern Pa.....	9.00 to 9.50
Shoveling steel, Chicago.....	8.75 to 9.50
Shoveling steel, St. Louis.....	8.00 to 8.50
Reroll'g rails, 5 ft. & ov., Pbgh.	12.00 to 12.50
Reroll. rails, 5 ft. & ov., Chgo.	10.00 to 10.50
Reroll. rails, 5 ft. & ov., Cleve..	11.00 to 11.50
Reroll. rails, 5 ft. & ov., E. Pa..	11.50 to 12.00
Reroll, rails, 5 ft. & ov., St. L.	10.00 to 10.50
Steel rails, short, Chicago.....	10.00 to 10.50
Steel rails, short, Cleveland.....	11.00 to 11.50
Steel rails, short, St. Louis....	9.25 to 9.50
Iron rails, Cleveland nom.....	11.75 to 12.00
Iron rails, Chgo.....	11.75 to 12.25
Iron rails, Cincinnati.....	10.25 to 10.75
Iron rails, eastern Pa.....	13.50 to 14.00
Iron rails, St. Louis.....	10.00 to 10.50
Iron rails, Pittsburgh.....	12.50 to 13.00
Frogs, switches, guards, Chgo...	9.25 to 9.50
Frogs, switches & g'rds, St. L..	9.25 to 9.50
Car wheels, (iron), Pittsburgh..	11.00 to 11.50
Car wheels, (steel), Pittsburgh.	11.50
Car wheels, Chicago.....	9.75 to 10.00
Car wheels, eastern Pa.....	10.75 to 11.25
Car wheels, Buffalo.....	10.00 to 10.50
Car wheels, N. J. points.....	9.00 to 9.25
Car wheels, St. Louis.....	10.00 to 10.25
Iron axles, Pittsburgh.....	17.50
Iron axles, Cincinnati.....	19.00 to 20.00
Iron axles, eastern Pa.....	18.50 to 19.00
Iron axles, Buffalo.....	16.00 to 16.50
Iron axles, Chicago.....	15.25 to 15.75
Steel car axles, New York.....	11.50 to 12.00
Steel car axles, Buffalo.....	12.00 to 12.50
Steel car axles, Cleveland.....	12.00 to 12.50
Steel car axles, eastern Pa.....	14.00 to 14.50
No. 1 busheling, Buffalo.....	8.50 to 9.00
No. 1 busheling, Pittsburgh.....	9.75 to 10.00
No. 2 busheling, Buffalo.....	6.50 to 7.00
Low phosphorus steel, Buffalo...	12.50 to 13.00
Low phosphorus steel, Pbgh....	13.75 to 14.00
Low phos. steel, eastern Pa.....	14.00 to 14.50
No. 1 forge, eastern Pa.....	8.50 to 9.00
No. 1 cast, eastern Pa.....	12.00 to 12.50
No. 1 cast, Pittsburgh.....	11.75 to 12.00
No. 1 heavy cast N. J. points..	11.25 to 11.50
Mall. iron, R. R., Cleveland....	10.00 to 10.25
Malleable railroad, Pittsburgh..	10.00
Malleable R. R., Buffalo.....	9.50 to 10.00
Malleable, R. R., east Pa.....	8.50 to 9.00
Bundled sheet, Pittsburgh.....	9.00 to 9.25
Bundled sheet, Cleveland (nom.)	7.75 to 8.25

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Penton's Book News

Penton Building Cleveland, Ohio

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How Dodge Brothers' Plant Was Reorganized

(*Continued from page* 916.)

than that of the machine shop and in addition waste heat boilers were provided to supply additional steam without adding to the fuel bills. Two stoker-fired furnaces are connected to each boiler forming a composite heat utilizing unit. The complete installation consists of six such units, or six boilers with 12 furnaces and stokers.

The waste heat boilers were furnished by the Wickes Boiler Co., Saginaw, Mich. They are of a special vertical water tube type, rated at 333 horsepower. They are arranged for double end operation, the waste heat coming in from the two furnaces. The boiler consists of an upper, or steam drum, and a lower, or mud drum, joined together by straight tubes. These tubes are 4 inches in diameter, 22 feet long and 136 in number. In addition a 20-inch re-circulating tube is provided in the center. Each boiler has a water heating surface of 3,307 square feet, and a superheating surface of 88 square feet. The boiler setting is steel jacketed. Water passes up the small tubes and down the re-circulating tube. The gases from the furnaces pass between the tubes and around the steam drum to the stack, there being but one pass for both furnaces.

To properly man the enlarged plant, the working force has been gradually increased until on April 10, 1915, more than 7,000 men were on the pay roll, exclusive of the office force.

It should be remembered that the entire development of the Dodge Brothers car has occupied less than a year and that during this short time the changes which have been outlined in the foregoing paragraphs were made to the plant.

It is only fair to state that the present Dodge structure could not have been reared, nor would a satisfactory product be possible, except on a foundation grounded on unusual manufacturing experience in the automobile and allied fields.

In conclusion it may not be amiss to state that financing in the usual sense of the term was not necessary for the accomplishment of Dodge Brothers purposes. All of the money that would be necessary to carry out the project to a satisfactory conclusion was in hand in the form of cash before the proposition was undertaken. Nevertheless the story of this achievement should be an inspiration to other manufacturers.

Using the Sales Engineer at Home

(*Continued from page* 930.)

multi-cutting, the time was reduced to about 40 minutes each and the piece work price cut down to 30 cents. The cost of special tools was a trifle over $100.

Piece *B* was also cast iron finished all over and took about an hour for both settings of the work by the old method; the piece work price was 45 cents each. Because of its fragility and the thin section of metal, fine feeds had to be used in machining, but by an improved method of holding, which gave support to the web, and some slight changes in tooling, a great deal better time was possible. Thirty minutes was found sufficient to machine the work complete by the new method and the piece work price was readjusted to 25 cents.

Piece *C* was originally machined in three operations, the first two of which were done on a horizontal turret lathe and the last, turning the outside tapered surface, on an engine lathe with taper attachment. By the old method the time for each piece was 30 minutes for the turret lathe work and 10 minutes for the operation of turning the taper, and the piece work price was 20 cents for the turret lathe and 5

cents for the lathe work, the total being 25 cents. By the use of special jaws and a taper attachment the work was done on a vertical turret lathe in 12 minutes and one setting only at a piece work price of 10 cents.

When the sales engineer makes an estimate on the cost of special tool equipment and gives a price to a customer, he naturally figures the labor cost as closely as he can, yet with enough allowance to take care of manufacturing contingencies. Sometimes the cost of the equipment when built, including overhead expenses, etc., is greater than the estimated cost and in a case of this kind the estimator is called up "on the carpet" and asked to give the reason for the variation in cost over his estimate. By getting from the cost department, all the time cards and stock orders for material used on the job, he can readily find out where the trouble lies. He may find that John Smith spent 12 hours on a job that he should have done in two hours and that Henry Doe took four days to assemble and fit some of the work which should have been put together in a couple of hours or so, if properly machined.

Seeking Cause of Trouble

Then by taking up the matter direct with the foreman under whose direction and supervision the work was done he soon locates the trouble and finds that Smith took so long on the job because a machine broke down and he charged his time against the special tool job instead of against repairs. Henry Doe was a faithful and industrious worker and the only excuse he had to offer was that the parts were so inaccurately made that many of them required re-fitting before they could be assembled. Going back a step or two further the estimator also finds that "for economy's sake" many of the parts were routed through the factory from department to department for the various operations of turning, milling, drilling, planing, etc., and that the time spent in setting up machines, studying the blue prints and asking questions, by a number of different men, had much to do with the excessive cost of the work. The work produced by this method also was hardly up to standard and naturally required a considerable amount of fitting.

Another field of usefulness to the manufacturer, is in estimating the cost of production of work which some other manufacturer wishes to have built outside his own factory. An automobile concern may wish to have its transmission units built at some other place on account of lack of room or facilities to do the work itself. In a case of this kind the sales engineer takes the blue prints and carefully lays out the work, giving a list of operations on the various components with an estimate of the time required for each, including manufacturing contingencies, setting up time, etc. He also estimates the cost of the material used and any jigs, fixtures or other special tools needed, so that the manufacturer can easily arrive at a decision regarding the cost of the work. Assembling, scraping, fitting, lapping or grinding are all taken into consideration so that there is little guess work about the estimate.

So it will be seen that in a number of ways the services of the sales engineer, are valuable to a manufacturer whether the season is dull or brisk, and his field of usefulness covers a wide range of work.

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